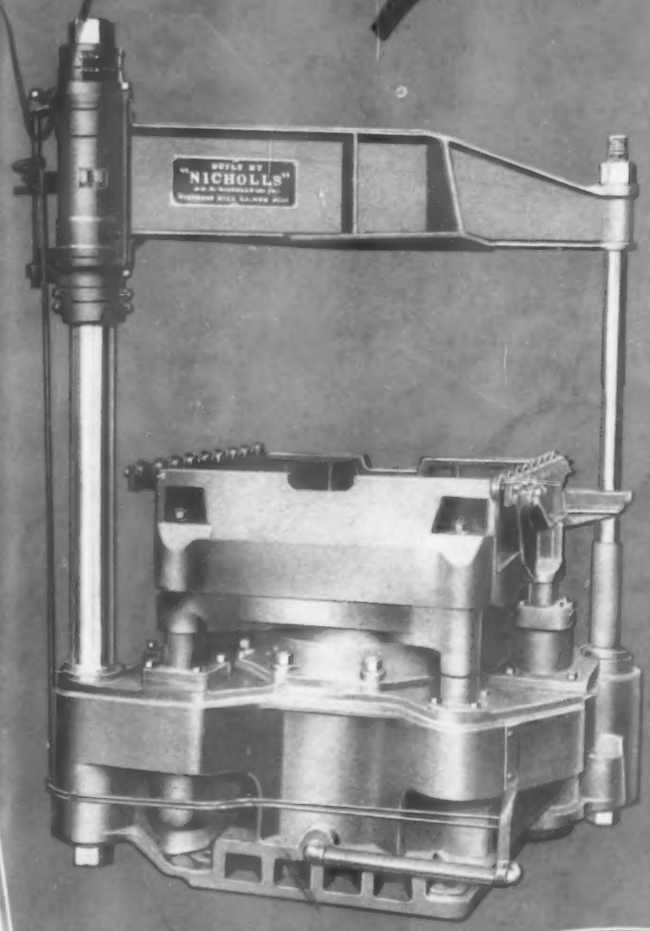
January, 1946

# THE FOUNDRY

*wherever metals are cast...*

TECHNOLOGY DEPT.

# History Recorded!




As we enter our 36th Year of continuous service to the Foundry Industry, another page is recorded in the already auspicious annals of NICHOLLS history. We are proud to have been singled out as leaders in our field, through war-time emergency and peace-time competitive advancement. NICHOLLS MOLDING MACHINES will continue to keep abreast of industrial changes and necessities in the future as in the past, through intimate knowledge of foundry requirements, research and highly skilled engineering. Your NICHOLLS Machines assure you of faster, more accurate and economical production in the truly modern NICHOLLS manner.

## WM. H. NICHOLLS CO., Inc.

**RICHMOND HILL (18) · LONG ISLAND · NEW YORK**

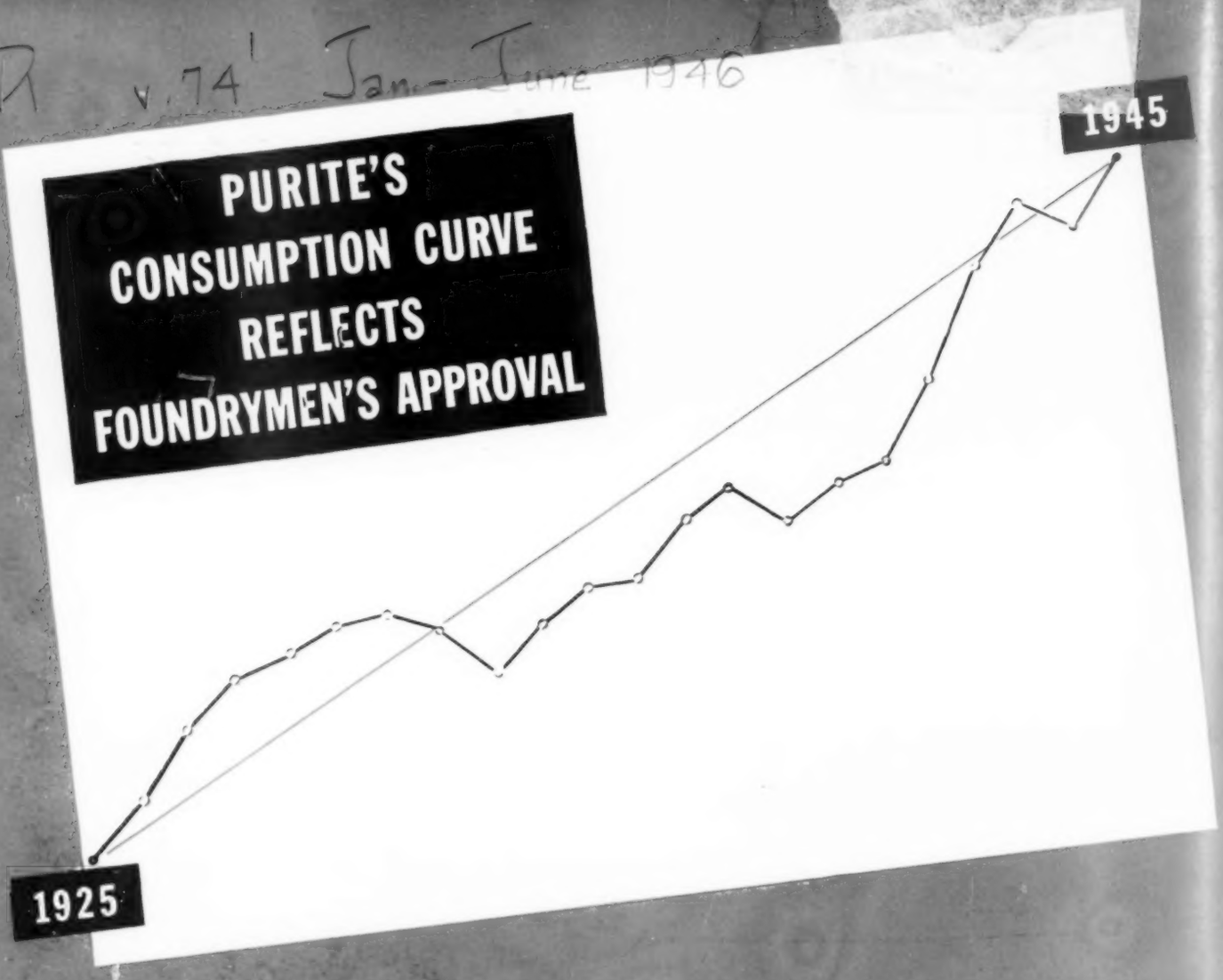
Foreign Manufacturers and Selling Agents—

For Continental Europe and Great Britain—The Ge... Fischer Steel and Iron Works, Scha... witzerland

WM. H. NICHOLLS CO. INCORPORATED RICHMOND HILL L.I. N.Y. BUILT BY

R v.74 Jan.–June 1946

# PURITE'S CONSUMPTION CURVE REFLECTS FOUNDRYMEN'S APPROVAL




The steady climb of this consumption curve *proves* the value of Purite in refining cupola cast iron. The increasing demand for this scientific flux over a 20-year span is the best testimonial foundrymen can give to Purite.

Purite's remarkable action in desulphurizing and refining iron in the ladle or in the cupola hearth—its effect on combustion—and its action in smoothing out cupola melting operations are the reasons behind the ever-increasing use of Purite by progressive foundrymen everywhere.

Purite does *more* than remove sulphur; it purges molten metal of occluded gases, entrained oxide-silicates and other non-metallic impurities that may cause pinholes, gas pockets and segregated defects. Refining with Purite increases the strength . . . improves grain structure and machinability . . . speeds production of cleaner, sounder castings.

According to a recent survey, over 70% of the foundries in four principal casting centers in the North, South, East and Midwest are using Purite regularly. We feel you'll want to know why so many foundries consistently order Purite—so write for free factual information that tells how Purite helps them, and how it can help you in these competitive days.

**Mathieson**
CHEMICALS
THIESON ALKALI WORKS (INC.)
STREET NEW YORK 17, N. Y.

99% PURE FUSED SODA ASH
**PURITE**
The Scientific Flux for Better Melting and Cleaner Iron

Tech

TECHNOLOGY DEPT!

# ...when it's OMEGA

Ever think of the beating a chipping tool absorbs?

The chisel gets it hot and heavy—punishing blows on the shank, a mauling on the cutting edge. Thousands and thousands and thousands of blows, day by day.

Omega steel is made to resist these blows. It's a tough, shock-resisting steel that's especially suitable for hand or pneumatic chisels, core breakers, and all other tools that must stand repeated impact at normal temperatures.

Working hardness, 58-62 Rockwell C—just right for cold-battering operations in foundry work. Whether you form your chipping tools yourself or buy them already finished, be sure you're getting Omega. You'll find it *pays* to buy a steel that is made specifically for your kind of job.

Omega holds its edge, it wears well, and it can take a slugging. It's your best bet for cleaner, faster chipping work—and core-breaking, too.

For information on physical properties, analysis, and applications, write for Data Book 143, Section G-1.

★ BETHLEHEM STEEL ★

## OMEGA... one of Bethlehem's BIG 8 Tool Steels

there's never any doubt about this sign: it always means C-sharp

## there's never doubt about the sign of FEDERAL GREEN BOND: it means the best of the Bentonites

Just as a certain symbol always indicates a certain note, the words "FEDERAL GREEN BOND" always indicate the best of the Bentonites. It means a constant, never-changing mix, whether it's a handful, a shovelful or a carload. This uniformity is one of the most important qualities of FEDERAL GREEN BOND.

# GREEN BOND

## THE FEDERAL FOUNDRY SUPPLY COMPANY

**4600 East 71st Street • Cleveland 5, Ohio**

Seacoal Plant
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# THE FOUNDRY

for JANUARY 1946

VOLUME 74 NUMBER 1



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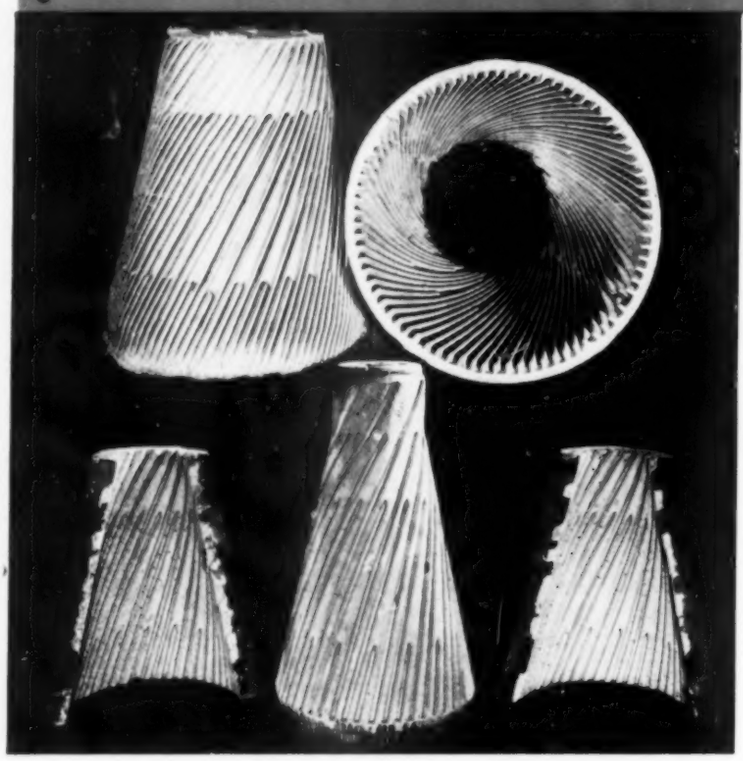
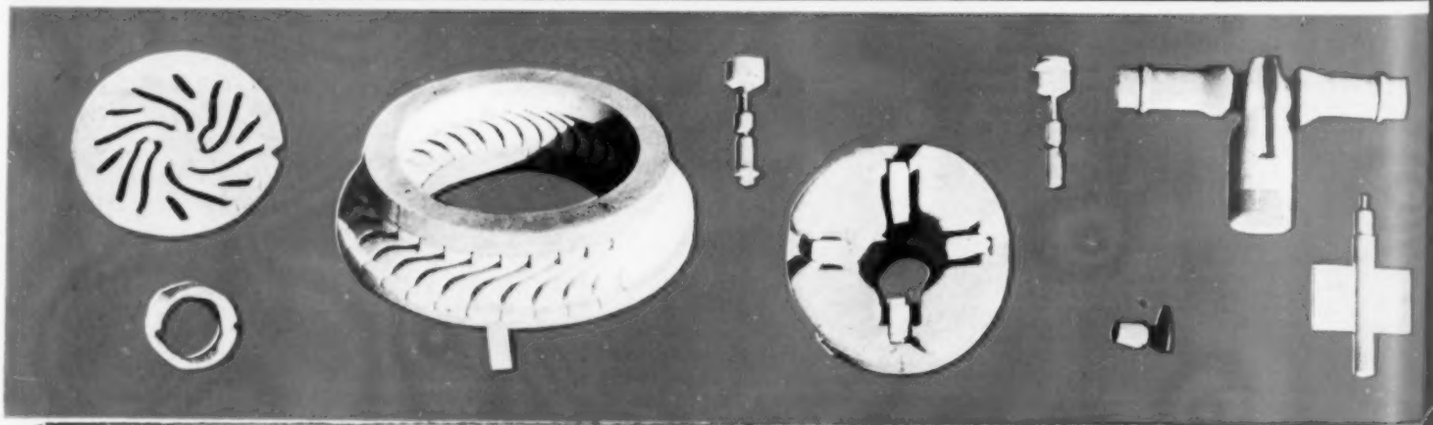
# OPERATE THE FOUNDRY



THE DURIRON COMPANY, DAYTON, OHIO, specialize in work for the Chemical Industry and castings must vary in analysis to meet powerful alkali or acid resisting requirements. Duriron regularly melts over twenty-five different alloys. Foundry scrap piles are scrupulously segregated, labeled, and card-indexed. Metallurgists work like drug prescriptionists. Metals are melted in direct arc, indirect arc, induction, and air furnaces. Duriron Company's cores are made with Linoil. Castings, with their cores, shown above are for refining paper pulp. They operate constantly in the presence of residual cooking or bleaching acids. The castings are made of a hardenable stainless steel alloy containing 12% chromium. Typical cores used by Duriron are shown below—Linoil cores.



**THE WERNER G.**

(DIVISION OF ARCHER-

2191 WEST 110 STREET WOODBINE

# LIKE A DRUG COUNTER

Linoil is used by The Duriron Company for their cores both in their regular manufacturing line and in their custom-made castings. "We use Linoil," says Mr. R. C. Schenck, Vice-President of the Company "because we have found it dependable. Our men are used to it, and there never is

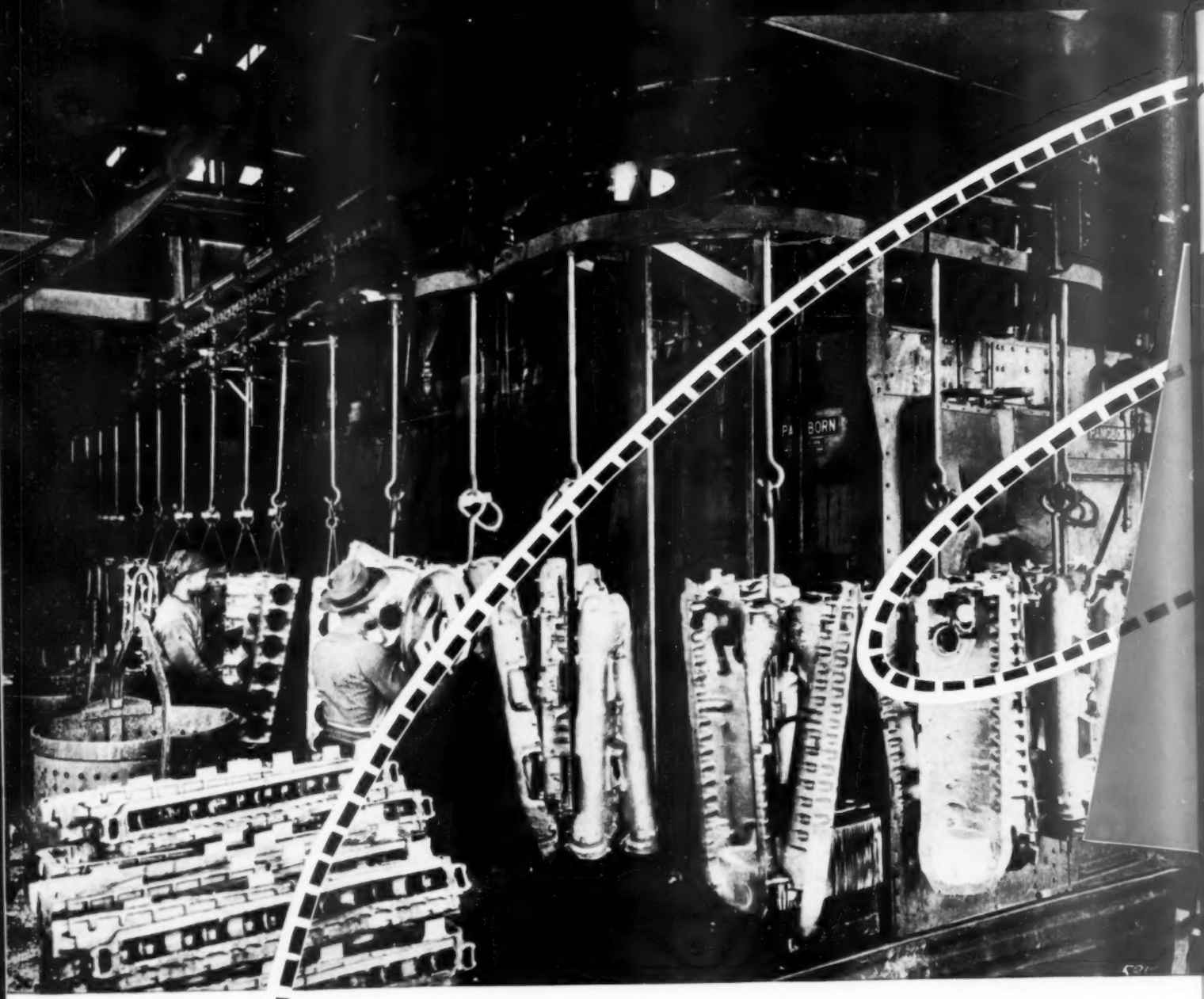
**LINOIL**

uncertainty about what the core reaction will be on new jobs. Of course we find it satisfactory in the other essentials, but I think we place prime importance on its uniformity." In this The Duriron Company takes the same position many other foundries do, both job foundries and production shops, that it pays to eliminate all possible elements of uncertainty in the making of castings. If you want strong cores, fast oven time, cores that vent properly and not through casting walls, that collapse for shrinking metal, that clean easily from the castings, cores that are uniform in all characteristics all the time, use Linoil, the logical oil for cores.

**SMITH COMPANY**

DANIELS - MIDLAND COMPANY)

4690 CLEVELAND 2, OHIO



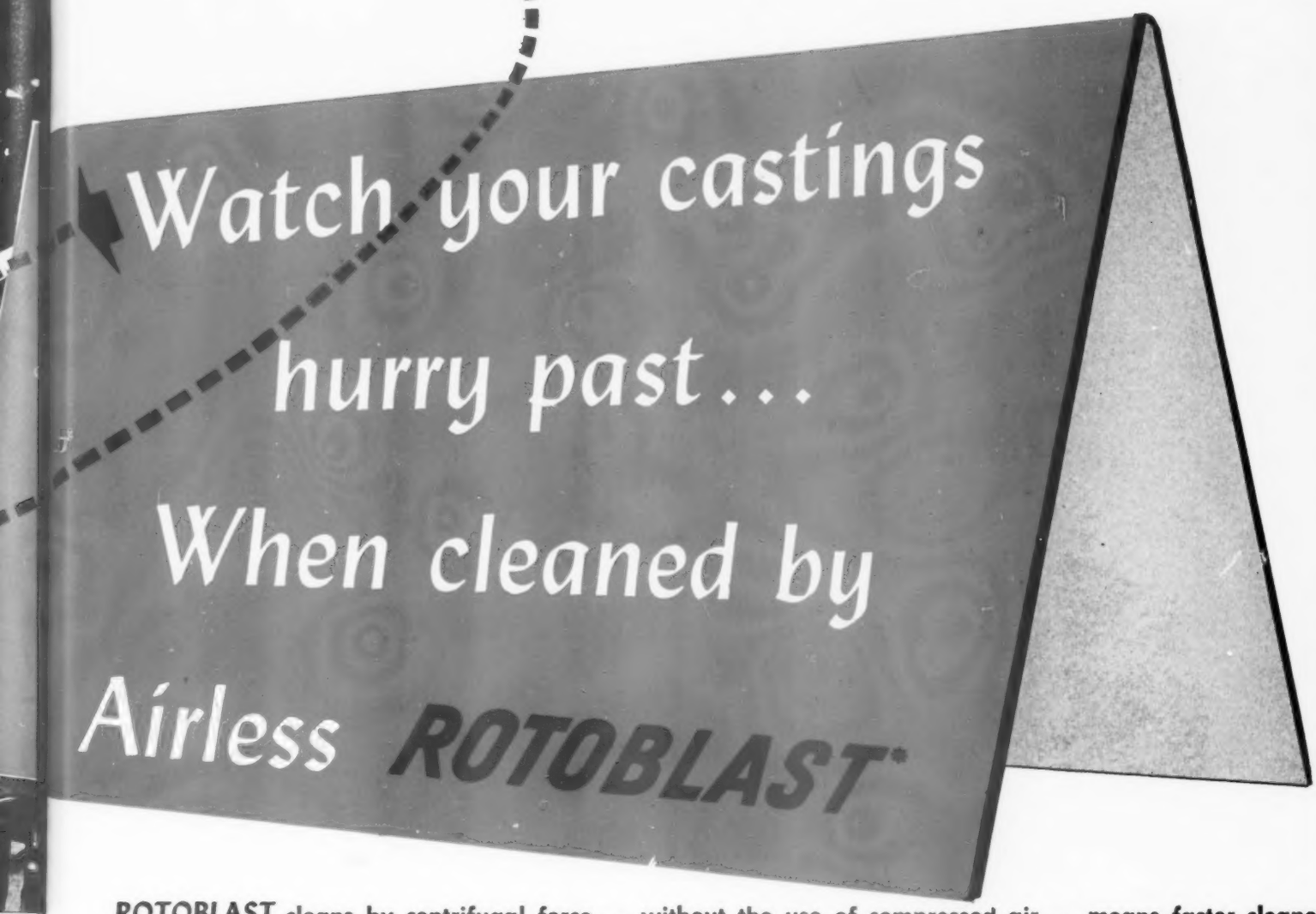

*TRADEMARK OF THE
PANGBORN CORPORATION

WORLD'S LARGEST MANUFACTURER OF BLAST

ARMY E NAVY
NSA
1944

# PANG

PANGBORN CORPORATION • • • • • • •




**ROTOBLAST** cleans by centrifugal force . . . without the use of compressed air . . . means *faster* cleaned castings, forgings, stampings and heat-treated parts. It means *better* cleaned surfaces for *faster*, lower cost machining, grinding and processing. Cost reductions over former cleaning methods are as much as 50% to 90%.

Because Pangborn Special ROTOBLAST Machines (like the one illustrated above which cleans more than 250 blocks an hour) are the answer to faster and cleaner production at lower cost, they are being ordered by forward-looking manufacturers. One of the leading automobile manufacturers recently purchased five additional Special ROTOBLAST Machines to clean cylinder blocks, transmission cases, transmission housings, etc. . . . and a well-known farm implement company just ordered three Special ROTOBLAST machines. Both these companies have just used ROTOBLAST equipment for years.

Let a Pangborn engineer make a survey of *your* cleaning room problems. You profit when you "come to Pangborn".

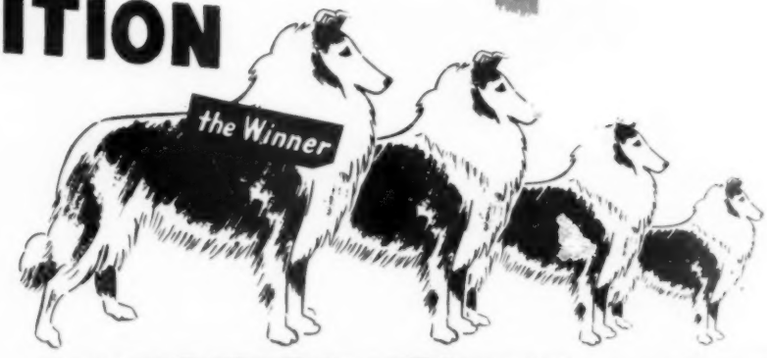
**CLEANING AND DUST CONTROL EQUIPMENT**

# BORN

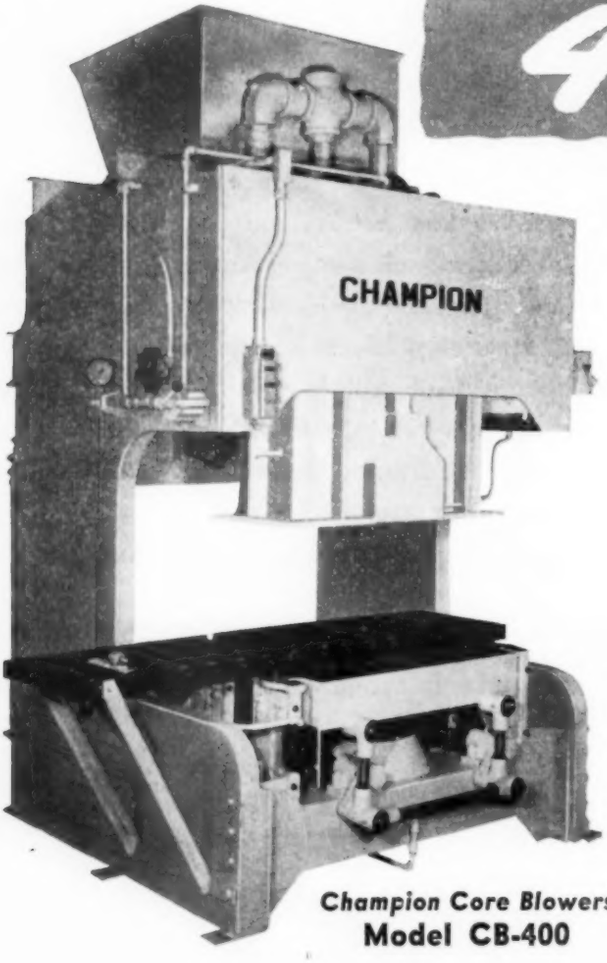
MANUFACTURER'S ASSOCIATION, INC. FOUNDRY EQUIPMENT

**. . . . . HAGERSTOWN, MARYLAND**

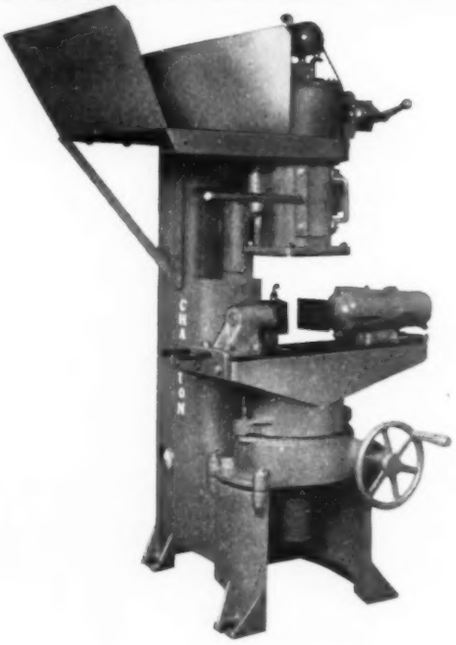
# RECONVERSION
WILL MEAN
# KEENER COMPETITION



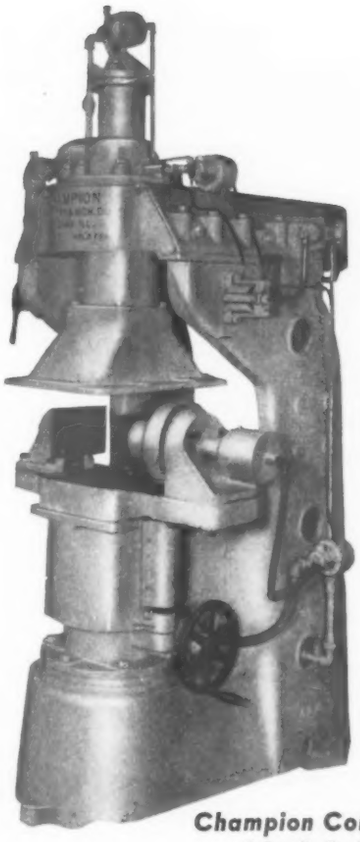

## 4 GREAT
ARE READY TO



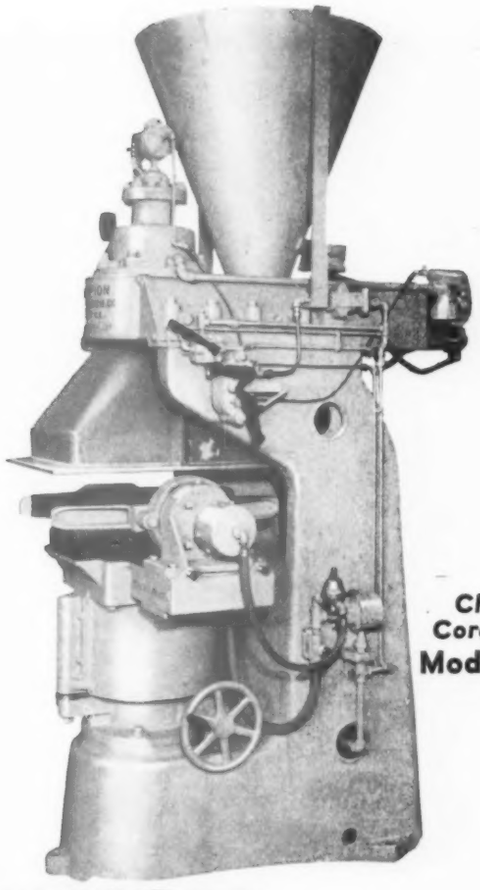

*Champion Core Blowers*
**Model CB-400**



*Champion Core Blowers*
**Model CB-10**



*Champion Core Blowers*
**Model CB-12**



*Champion*
*Core Blowers*
**Model CB-15**

# CHAMPIONS
## MEET THE CHALLENGE

These four great *Champions* are True-Blue Ribbon winners—*Champions* every inch and every pound of them, backed by almost a half century of foundry "know-how." That's why we at *Champion* can guarantee complete satisfaction from every installation. Each model has been tried and proved in many of the world's leading foundries, small and large.

By simply setting the box and pulling the lever, any person without previous experience can produce perfectly rammed cores on a *Champion*. A single valve operates the core box clamp, clamps same against the blow plate, blows the core, exhausts and releases the clamp in the proper cycle. Regardless of size or design —small or large, simple or complex cores —the ramming time is identical.

When keener competition comes, stay with the winner, who'll still be *Champion*.

**CHAMPION**
FOUNDRY & MACHINE CO.

**1318 WEST 21st STREET CHICAGO 8, ILLINOIS**

# 650 Pounds of Efficiency

## LECO 2600

## Combustion Furnace

**You don't drive your automobile wide open all the time. Why punish your combustion furnace?**

**The Leco 2600 Combustion Furnace will attain a top temperature of 3000 degrees F.**

**It just coasts along at a *CONTINUOUS 2600 DEGREE TEMPERATURE* at very low cost of operation and element cost.**

**It idles at from 2300 degrees to 2600 degrees with unsurpassed economy.**

Combustion temperatures in analysis are constantly going up. Alloy steels present no problem at sufficient temperatures. The latest methods of sulphur analysis require a minimum of 2600 degrees.

Regardless of the temperature range you are interested in, the Leco 2600 eliminates all worry regarding sufficient temperature, at extremely low operating costs, and without punishing the furnace.

*For illustrated literature write to*

## LABORATORY EQUIPMENT CORPORATION

**Benton Harbor, Michigan**

HOWARD craftsmen and facilities are available to produce quality wood and metal patterns.

HOWARD craftsmen thoroughly understand foundry practices.

HOWARD patterns are engineered to fit your foundry requirements.

HOWARD modern facilities include two three-spindle type Keller Duplicators which are available for all types of metal duplicating work.

## HOWARD FOUNDRY CO.

***Pattern Division***

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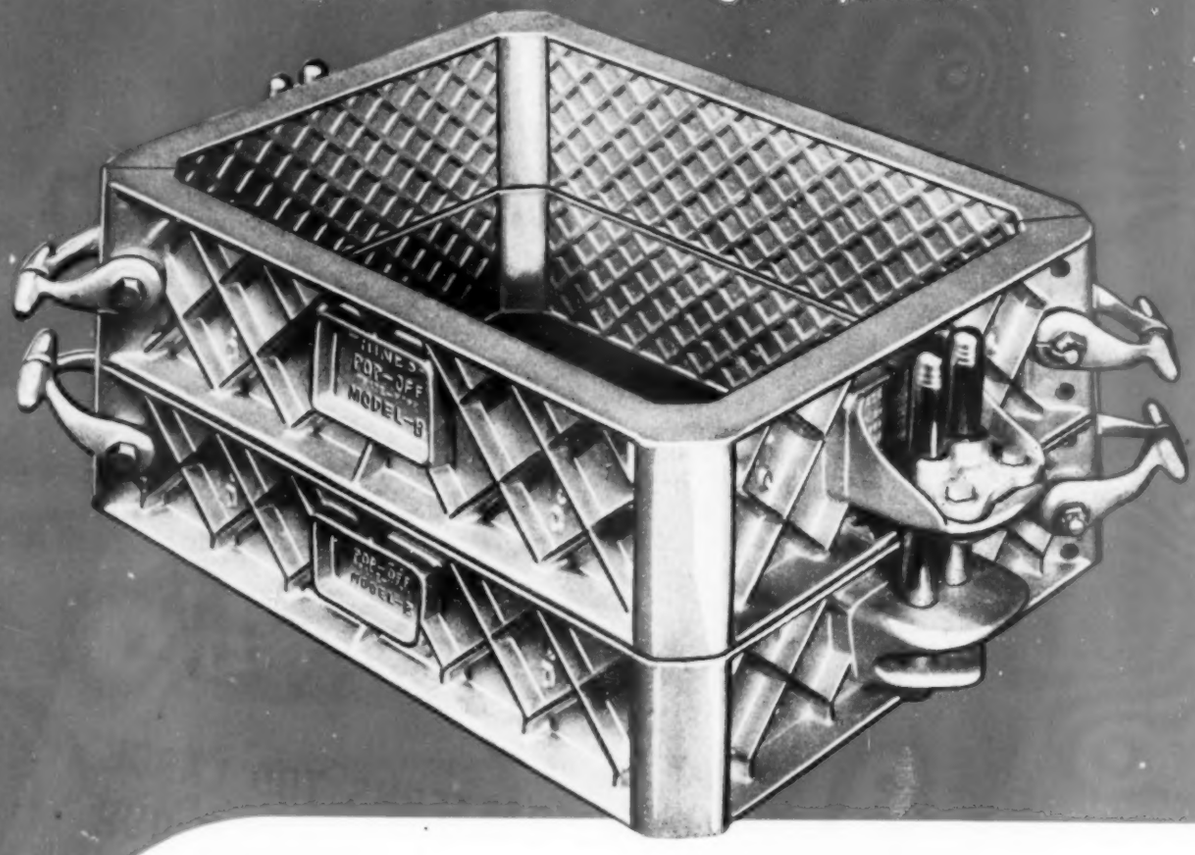
*Hines Model "B"*

# ALUMINUM POP-OFF FLASK

for high production on light squeezers




HINES
POP-OFF
(Trademark Reg. U. S. Pat. Off.)
FLASK

## The LIGHTER WEIGHT

This illustration of the Hines Model "B" Aluminum Pop-Off Flask is a good picture of a good product—but many of its important points can't be *seen*. Some of these points are LIGHT WEIGHT, EXTREME DURABILITY, LOW PRICE, UTILITY and the fact that it will ELIMINATE SHIFTS. Hines Flasks are designed to "make the tough jobs easy"; they set a pattern for economical foundry operation.

***FOR BEST RESULTS, USE HINES JACKETS***

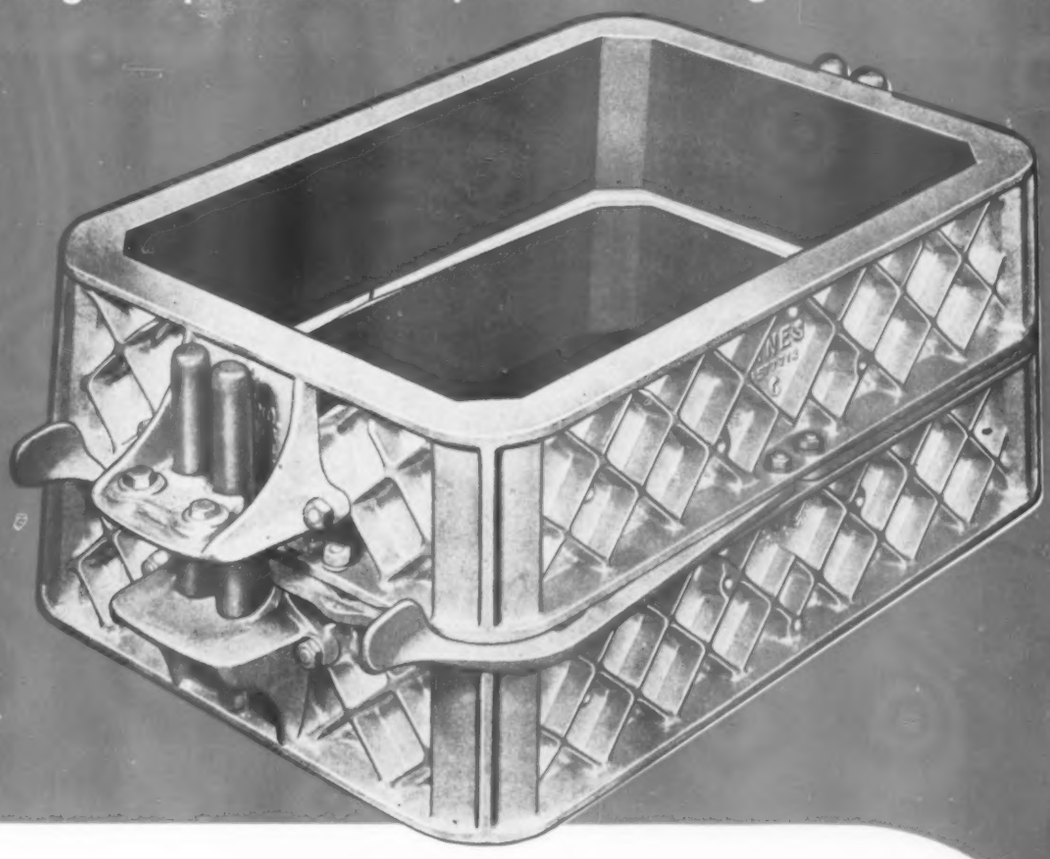
# THE HINES

1324 HIRD AVENUE

*Hines Model "A"*

# ALUMINUM SLIP FLASK

for light squeezers . . . pattern casting . . . trade schools



## METALLIC FLASKS

The Hines Model "A" Aluminum Slip Flask is particularly recommended for light squeezer work, pattern casting and for trade schools. It is much lighter in weight than the ordinary flask, making the molder's work that much easier. It costs less, outlasts other flasks, and reflects credit on an organization that has been exclusively a builder of flasks and jackets over a period of twenty-five years.

*All Hines Flasks are fully protected by U. S. and Foreign Patents*

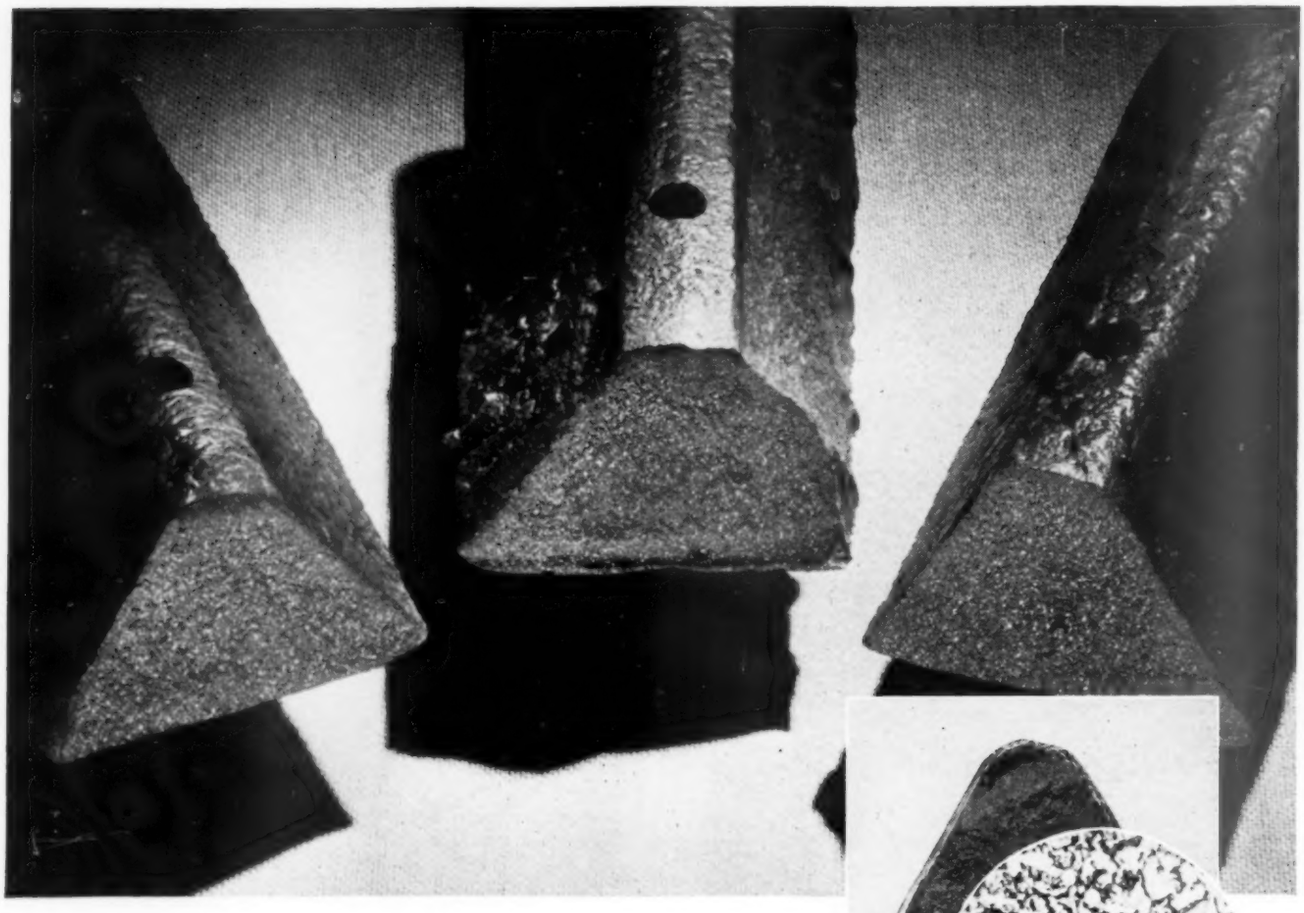
***THEY ALWAYS FIT THE MOLD SNUGLY***

# FLASK CO.

CLEVELAND 7, OHIO

# 3 G-IRON* PIGS

## Each a different silicon content...yet all the same uniform grain structure



| | LEFT | CENTER | RIGHT |
|---|---|---|---|
| Silicon | 2.12 | 2.71 | 3.35 |
| Total Carbon | 4.18 | 4.01 | 3.79 |

Note refined, uniform grain structure of these G-Iron pigs with varying silicon content. This same uniformity follows through into the casting, making possible the production of thin and thick sections, without internal shrinkage and porosity, and improved machineability.

*G-Iron is graphitized pig iron. The photographs show its grain structure. The Photomicrograph (circle, etched, 500 diam.) shows the random graphite evenly distributed. Manufactured under U. S. and Canadian patents.

# TONAWANDA IRON CORPORATION

NORTH TONAWANDA, N. Y.

Division of American Radiator & Standard Sanitary corporation

*Now Available*

## TO EVERY FOUNDRY

# MINCO BOND

## NEW ERA IN AMERICAN FOUNDRY SAND PRACTICE

Coming up over the horizon of the Foundry world of today dawns a new era in modern foundry sand practice.

Where, in the days before the war, foundry sands and bonds were acquired for their green strength only,—today, the production foundries are demanding and are able to get a mineral bond, which not only has green strength, but has high FLOWABILITY and high COLLAPSIBILITY as well.

It is now fully recognized that a foundry sand with high FLOWABILITY *INCREASES* production of castings at least 25%, and that high COLLAPSIBILITY *INCREASES* the flow of castings thru the cleaning equipment sometimes as much as 50%.

MINCO BOND has high FLOWABILITY as well as high COLLAPSIBILITY and it imparts these qualities to any other bond with which it is used.

In two of the newest and largest implement production foundries in North America, the use of MINCO BOND in their sand systems, is *turning out more and better castings per man hour, than can be claimed for any other bond, in any other production foundry in North America.*

Due to its high dry strength and non-shrinking characteristics, MINCO BOND is valuable in dry sand work on jobbing floors.

MINCO BOND is used as the sole bonding agent in rebonding heaps in heap system foundries. After the castings are poured, the sand can be reconditioned as easily as natural molding sand and casting cleaning expense will be substantially reduced.

Below are the physical qualities of MINCO BOND. In no other mineral bond in the foundry world can you purchase so much intrinsic value for your dollar.

1. HIGH FLOWABILITY which increases production.
2. HIGH COLLAPSIBILITY which increases flow of castings thru cleaning equipment (reduces shake out and cleaning costs).
3. HIGH DRY STRENGTH.
4. LOW HOT STRENGTH AT POURING TEMPERATURES (eliminates cracked castings).
5. GOOD GREEN STRENGTH.
6. NO EXPANSION AND NO CONTRACTION AT ROOM TEMPERATURES.
7. The use of MINCO BOND SLOWLY INCREASES PERMEABILITY AND
8. INHIBITS THERMITE REACTION which eliminates casting blows.
9. REDUCES SCRAP LOSSES due to sand failure.
10. MAKES SMOOTHER CASTINGS.

Write for our booklet

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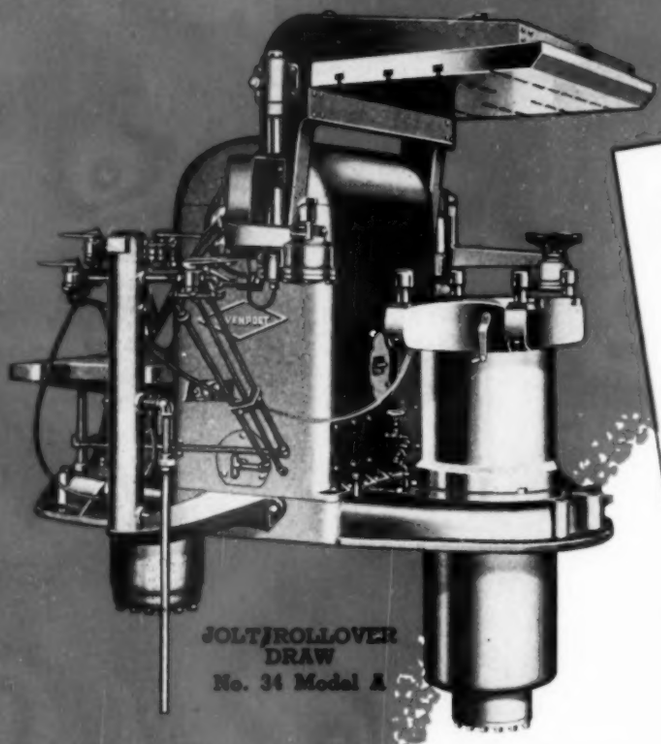
INDUSTRIAL FOUNDRY SUPPLY CO., Inc., San Francisco, Calif.

# *Modern* DAVENPORT MOLDING MACHINES

## *will save man hours* IN YOUR FOUNDRY



JOLT ROLLOVER DRAW
No. 34 Model A

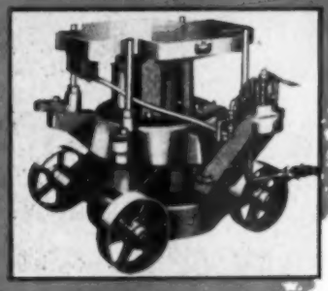
**Better quality Castings**

- IN LESS TIME
- AT LOWER COST

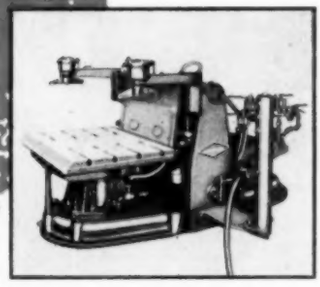
Davenport Modern Molding Machines are easy to install . . . with central control column conveniently located for operation . . . air operated flask clamp arms . . . hydraulic check cylinder . . . automatic flask leveler . . . hydraulic accurate steady draw . . . valveless jolt which eliminates unnecessary servicing . . . self-cleaning striking pad. These are only a few of the many features found on these dependable molding machines.

Davenport Molding Machines are made in 33 sizes and models to meet practically every requirement for steel, malleable and gray iron castings, also magnesium and other non-ferrous castings.

Let us send you our complete catalog.



PIN LIFT (portable)
No. 24 Model AJS



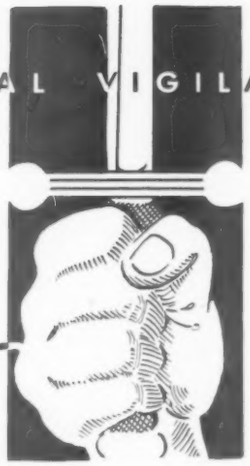
JOLT ROLLOVER DRAW
No. 34 Model SA

**DAVENPORT MACHINE AND *Foundry Company***

DAVENPORT IOWA U. S. A.

Canadian Representatives: Canadian Foundry Supplies & Equipment, Limited, Toronto and Montreal

ETERNAL VIGILANCE IS THE PRICE OF SAFETY



# Eternal Vigilance SAFEGUARDS THE QUALITY & UNIFORMITY OF

# DELTA FOUNDRY PRODUCTS

From basic raw materials to finished products, every step in the manufacture of DELTA FOUNDRY PRODUCTS is under strict laboratory control . . . THUS, CONSTANTLY UNIFORM QUALITY STANDARDS ARE RIGIDLY MAINTAINED

DELTA Products for the Foundry are products of scientific research, each developed to do a SPECIFIC JOB better and more economically . . . and each pre-tested and approved in actual use before being announced to the industry.

Leading foundries throughout the U. S. and Canada prefer and use DELTA Foundry Products and, regardless of what your requirements may be...normal or critical...you will benefit by DELTA'S laboratory-controlled quality standards.

*Ask for information on how YOU can use DELTA Foundry Products to cut your foundry costs.*

## DELTA CORE & MOLD WASHES

**BASE MATERIAL**
Mix with silica flour and water to produce finished base.

**FOR STEEL**
STEELKOAT
SPECIAL CORE & MOLD WASH

**FOR ALUMINUM**
GRAKOAT A-1

**FOR GREY IRON AND MALLEABLE**
GRAKOAT – BLACKOAT

**FOR NON-FERROUS METALS**
NON-FERRUSKOAT

**FOR ALL SAND CAST METALS**
THERMOKOAT – It's Plasti-Lastic

## OTHER DELTA FOUNDRY PRODUCTS

PARTEX (Nut Shell Parting) • LIQUID PARTING • CORE ROD DIP OILS • CORE OILS AND BINDERS • SPRAY BINDERS NO VEIN COMPOUND • MUDDING AND PATCHING COMPOUND SAND CONDITIONING OILS • CHILLKOAT

# DELTA OIL PRODUCTS CO.

MANUFACTURERS OF FOUNDRY PRODUCTS, INDUSTRIAL AND AUTOMOTIVE OILS, GREASES AND COMPOUNDS
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# UNITED STATES ELECTRICAL TOOLS

will help you glide into your 1946 programs with ease and every assurance of better and more economical production.

These famous tools are better than ever . . . embodying the experience gained since 1897 PLUS the lessons learned "the hard way" during the war years.

**Look to United States Electrical Tools to Help You Cut Costs and Increase Production in '46**

## PORTABLE ELECTRIC GRINDERS

**4" to 8" — from 1/3 h.p. to 1 h.p.**

For grinding, buffing, polishing, sanding down castings and other operations. For production or maintenance. Chrome nickel alloy steel gears, hardened, in greasetight case. Over-size ball bearings throughout. Universal motor.

## SWING FRAME GRINDER

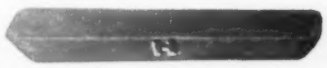
Perfect visibility; perfect balance laterally and rotatively; angular adjustment 45° to right and 80° to left; easy wheel change; ball bearing. Chips and dirt removed in grinding slide off.

THE United States ELECTRICAL TOOL CO.
CINCINNATI 14, OHIO

# HANNATEN IRON INGOT

GRADES:
BASIC
SILVERY
FOUNDRY
MALLEABLE
FERRO-SILICON

BRANDS:
SUSQUEHANNA
BUFFALO
DETROIT



For those foundries that find the larger pig better suited to their present needs, the 38-pound Hanna pig is available in all grades of Hanna iron.

THE BEST KNOWN NAME IN IRON

The HannaTen ingot is the answer to the foundryman's need of a "better iron for a better casting." Developed by years of research and experimentation, this ten-pound ingot, now available in all grades and brands of Hanna iron, permits more efficient handling—uniform melting—accurate weights per charge . . . resulting in finer-grain-structure castings. HannaTen is priced the same as the regular Hanna pig. For full details, just write or phone the nearest Hanna office.

**THE HANNA FURNACE CORPORATION**
**MERCHANT PIG IRON DIVISION OF**
**NATIONAL STEEL CORPORATION**

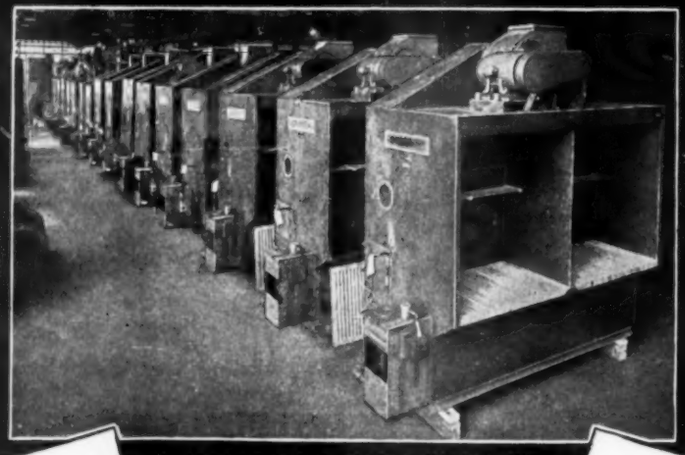
PATENT PENDING

BUFFALO • DETROIT • NEW YORK • PHILADELPHIA • BOSTON

1. Special propeller blade grinding bench.

2. Booth type bench for magnesium casting finishing.

3. Finish grinding bench for small parts—equipped with filter after-cleaner.



4. Production line of Type N Roto-Clone booth-type benches for grinding and burring magnesium castings.

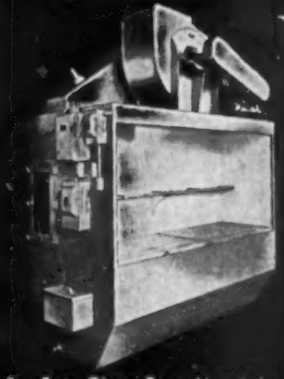
5. Special Roto-Clone grinding bench with filter after-cleaner for flexible shaft grinding.

6. Propeller blade grinding and polishing bench with filter after-cleaner.

AAF
AMERICAN AIR FILTERS

7. Group of four benches served by single Roto-Clone unit with after-cleaner for small parts burring.

When requesting information on these special Roto-Clone benches, please identify them by number.



8. Roto-Clone Type N grinding bench for large magnesium castings.

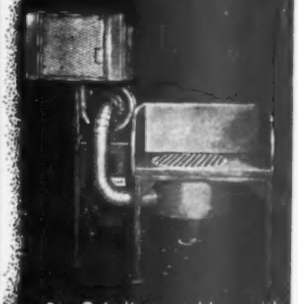
# ROTO-CLONE

***Dust Control***

## GRINDING BENCHES SPEED PRODUCTION

Shown on this page are some of the special AAF Roto-Clone grinding benches typical of the special designs that are available, or that can be made to meet specific grinding needs. If you will submit your problem to us we will be glad to help you solve it. There is no obligation.

**AMERICAN AIR FILTER COMPANY, INC.**
**266 Central Avenue** INCORPORATED **Louisville, Ky.**
**In Canada: Darling Bros., Ltd., Montreal, P. Q.**



9. Grinding table with rotating grill to facilitate working.

# Time-honored abrasive products are now further distinguished by *a renowned name*

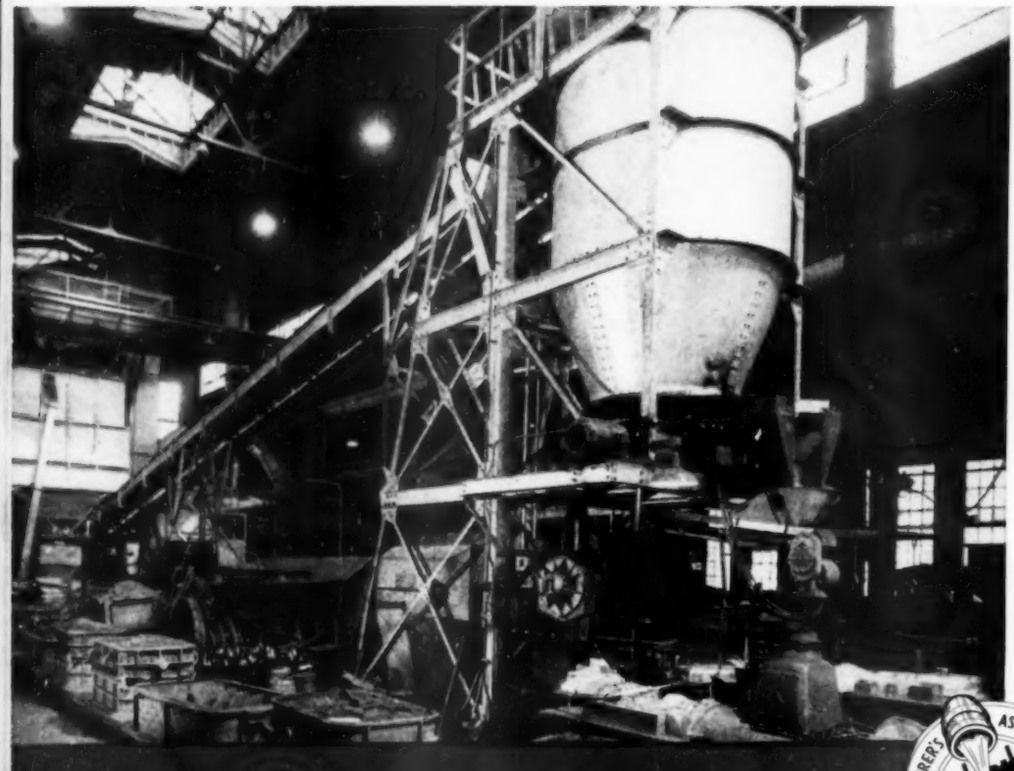
**SIMONDS ABRASIVE CO.**

**For more than half a century the name Abrasive Company has been synonymous with high quality grinding wheels and abrasive products. With the years has come a tremendous increase in the use of such products and the unqualified trademark designation "Abrasive" is now inadequate as a general term to distinguish this old company. Therefore, in order to establish a more distinctive identity for the organization, a more individual crest for its quality and service, the name Simonds, renowned for over a century for excellence in cutting tools, will designate product and company.**

**Operating under the same management and policies, SIMONDS ABRASIVE COMPANY will continue to turn out the same products of top performance which so distinguished the Abrasive Company during the past half century. SIMONDS ABRASIVE COMPANY goes forward, pledged to continue to justify the confidence of its old customers and to merit and inspire the patronage and good will of new ones.**

**SIMONDS ABRASIVE CO., TACONY AND FRALEY STS., PHILADELPHIA 37, PA.**

# National sand
# ...fit your plant ..



## ...large work

General view of the sand preparing and handling and mold handling unit at the Minneapolis plant of the Minneapolis-Moline Power Implement Company. In the background is the sand preparing plant with sand storage bin, No. 3 Simpson Intensive Mixer and National hexagonal revolving screen with fines control manifold. In the foreground is the prepared sand storage bin with rotary table feeder to sand slinger. The National continuous heavy-duty power mold conveyor is shown to the left. Cores are set, molds closed and poured on this conveyor. This installation permits the production of 250 molds a day on less than a fifth of the floor space formerly required.

## ...light work

View of the light molding unit at the Hopkins, Minnesota plant of the Minneapolis-Moline Power Implement Company. Some of the twenty molding machines are shown in the background. The National prepared sand hoppers are fitted with quick-acting, air-operated overcut gates with knee valves at the molding machine so that the operator will have both hands free to spread and tuck the sand as it drops into the flask. The molds are run out on a roller conveyor, and are poured from an overhead light bridge crane. Shake-out operation is accomplished by merely pushing the mold off the roller conveyor onto the inclined chute. Sand and castings drop to the conveyor beneath, and the board is placed on the return roller conveyor.

# preparing systems ...do your job best!

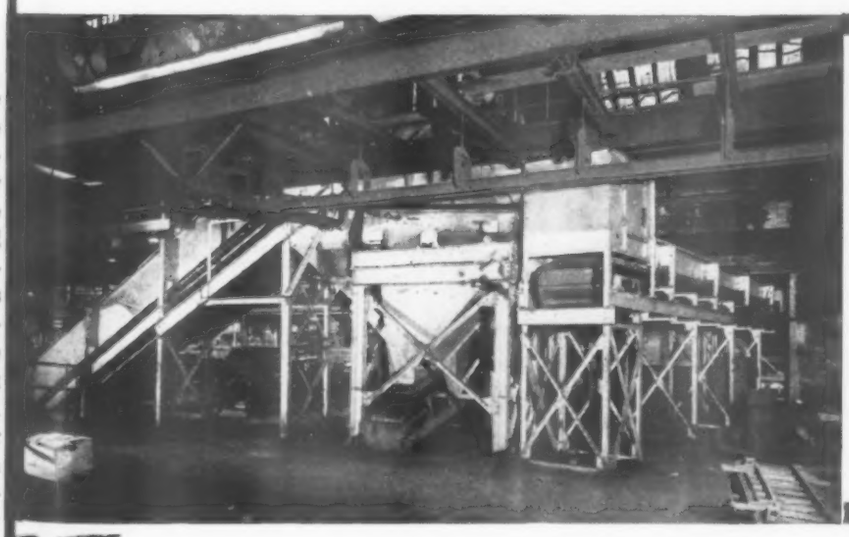
## National Engineering Service
### equips you to turn out better castings
### ...at lower cost

Let National Engineers plan YOUR sand system for you. They will design it to fit your specific requirements EXACTLY . . . so that your work will flow smoothly from one operation to the next with the greatest economy and efficiency possible. A National engineered system, with Simpson Mixers and National Auxiliary Equipment will help you turn out more, better castings at less expense,

Illustrated here are two National systems in plants of the Minneapolis-Moline Power Implement Company. The first National System was installed at their Minneapolis plant.

That this installation was satisfactory from every standpoint is apparent by the installation of a second National System at their Hopkins, Minnesota plant for producing lighter castings.

Everywhere, in modern foundries of every size and type, you will find the efficient sand systems engineered by National. Why not use this National experience (over 30 years) yourself. Prepare now for a busy and prosperous future. We'll be glad to help you.



This photo shows the hooded sand castings conveyor as it comes up out of the floor at the left. Castings and sand are delivered to the vibrating shakeout screen which delivers the castings to the steel castings conveyor at the right. The castings are carried into the cleaning room and delivered to a sorting conveyor. Sand is returned to the preparing plant which incorporates a National hexagonal revolving screen with fines control manifold, storage bin and No. 3 Simpson Intensive Mixer. The No. 3 Mixer, fitted with National Timemaster and cooling hood has ample capacity to supply the twenty molders.

...Send for—

*this new booklet—"Data for Engineers" which contains details of varied sand preparing systems. It will be especially useful to foundry engineers laying out new preparing plants.*

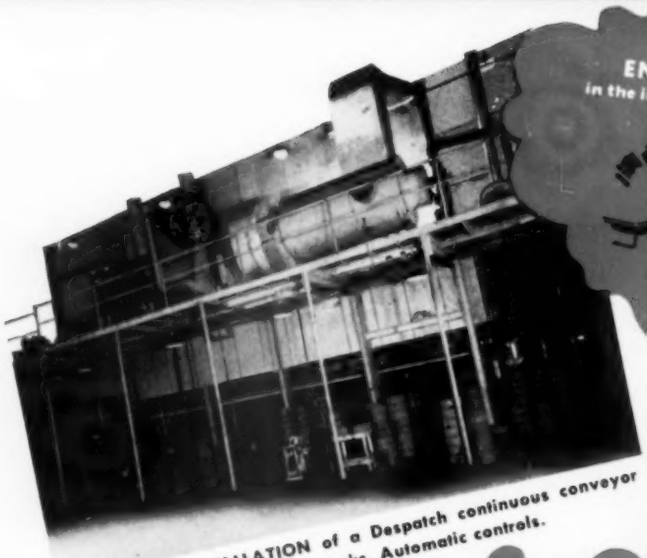
**NATIONAL ENGINEERING COMPANY**

**MACHINERY HALL BUILDING • CHICAGO 6, ILLINOIS**

Manufacturers and Selling Agents for Continental European Countries:—The George Fischer Steel & Iron Works, Schaffhausen, Switzerland. For the British Possessions, Excluding Canada and Australia—August's Limited, Halifax, England. For Canada—Dominion Engineering Co., Ltd., Montreal, Canada. For Australia and New Zealand—Gibson, Battle & Co., Pty., Ltd. Sydney, Australia

# Why you get *Faster Installation* of New DESPATCH FOUNDRY OVENS

**LARGEST ENGINEERING STAFF**
in the industry. Experienced specialists can handle any job.



**A UNIQUE INSTALLATION** of a Despatch continuous conveyor oven. Carries 38 roomy core racks. Automatic controls.

**BAKES THICK & THIN CORES** at the same time! A type Despatch drawer oven. Immediately available in 48 models.

**HUGE PRODUCTION FACILITIES**
in large, modern plant to build your new equipment quicker.

**TEN TON BATCHES** are baked in this Despatch combination gas or oil-fired, car-loaded oven. Has chamber 23 ft. long, 13 ft. high, 8 ft. wide.

**FAST, NATIONWIDE INSTALLATION**
by competent erection engineers. No waiting assures correct assembly and adjustment.

**STRAIGHT LINE PRODUCTION** of cores is easy with this Despatch oil-fired vertical conveyor oven. Bakes 5,000 lbs. of cores per hour.

DESPATCH OVEN COMPANY
619 S.E. 8 St., Minneapolis 14, Minn.

Without obligation, rush details about prompt delivery of the following Despatch Batch Type Ovens:

☐ RACK TYPE ☐ TRUCK TYPE ☐ DRAWER TYPE
☐ CAR TYPE ☐ SHELF TYPE ☐ SPECIAL_____
FUEL: ☐ Gas ☐ Oil ☐ Electric DELIVERY: in_____days
BAKING CAPACITY (tons of sand per day):_____
☐ SEND ENGINEER to discuss our oven requirements.

Your Name_____Title_____
Company_____
Address_____
City_____Zone_____State_____

**DESPATCH OVEN COMPANY** MINNEAPOLIS 14 CHICAGO 1

# GOVERNMENT SURPLUS STEEL

## AVAILABLE NOW THROUGH RFC

## Liberal Price Reductions

This is an unusual opportunity for many manufacturers to get ahead in their reconversion program. While some of the sizes, shapes and alloys of the RFC stock of surplus steel may differ from the specifications of normal industry requirements, it has the advantage of being quickly available.

Attractive allowances have been made in our pricing program to move this steel into the hands of private industry.

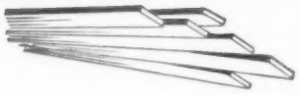
### HOT ROLLED PLATES

**Carbon and Alloy.** Wide range of sizes from ¼" to 6" thick, up to 96" wide.

### TOOL STEEL

**7,000 tons.** In Water-hardening, Oil-hardening and High Speed grades. Large range of bar sizes.

### STRIP STEEL



Available in Hot Rolled and Cold Rolled, Carbon and Alloy. Large quantity of High Carbon Cold Rolled Strip—to be sold at low Carbon prices—or lower. Large range of sizes.

### BAR STEEL

Hot Rolled and Cold Finished in both Carbon and Alloy. Rounds, squares, flats and hexagons in various specifications. Many items in large quantities.

***Write, wire or phone your requests to the nearest RFC agency listed below for more detailed information. If you desire, credit terms can be arranged. If your local office does not have all the materials you need, it will endeavor to locate them from other offices throughout the country.***

## CHECK THIS LIST

### Miscellaneous STEEL PRODUCTS

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*A Disposal Agency Designated by the Surplus Property Administration*

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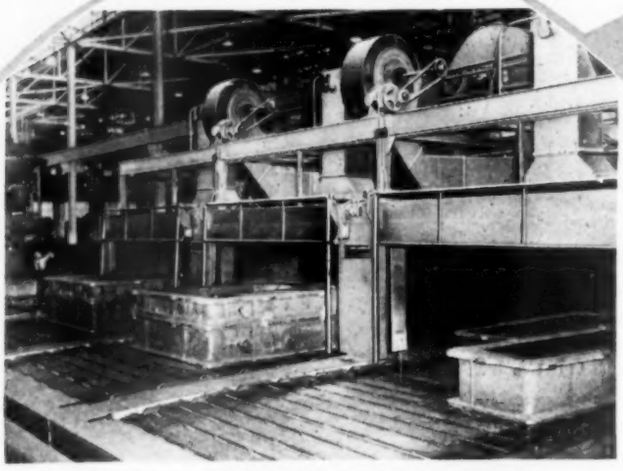
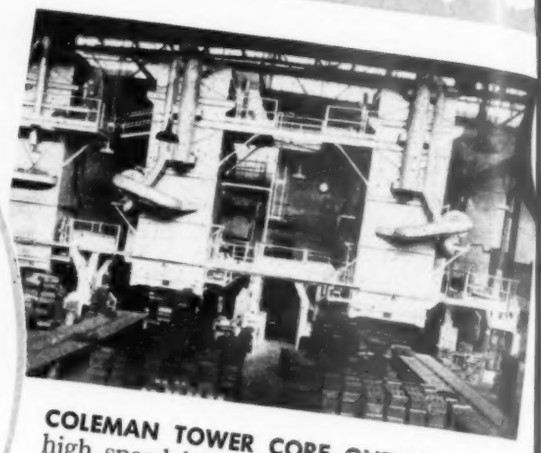
157-1

# COLEMAN CONVEYOR OVENS

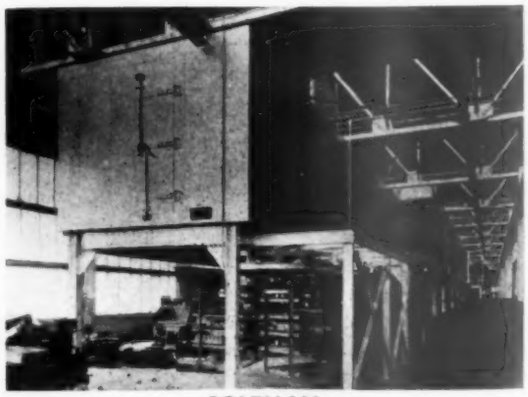


**COLEMAN CONVEYOR MOLD OVENS**—For high speed continuous drying of molds. The sensational results produced by these patented ovens have created entirely new conceptions of mold drying speed and dry sand economy in both gray iron and steel foundry operation.



**COLEMAN TOWER CORE OVENS** — For high speed baking of medium to small cores. Save floor space, labor and fuel. Patented Center Passageway permits loading from both inside and outside the Tower and increases loading accessibility by as much as 300% compared with other vertical oven designs.

**COLEMAN HORIZONTAL FLIGHT CONVEYOR OVEN**—For redrying cores and core assemblies after pasting, blacking or washing. Wide range of sizes and capacities.



**COLEMAN HORIZONTAL OVERHEAD CONVEYOR OVEN**—This design offers outstanding advantages in serving core departments employing large numbers of core-makers in production foundries making automotive, agricultural and similar castings.

**COLEMAN CORE and MOLD OVENS**

*The* FOUNDRY

CLEVELAND

BUILDERS OF COLEMAN

# Greatest Line of Continuous Ovens Built!

EVERY foundry has its own production problem. Equipment that is right for one foundry may be absolutely wrong for another. Therefore, a successful mechanized core oven installation requires a proper analysis by thoroughly competent and experienced engineers.

Coleman Oven Engineers offer the most extensive background of successful experience in the foundry oven field.

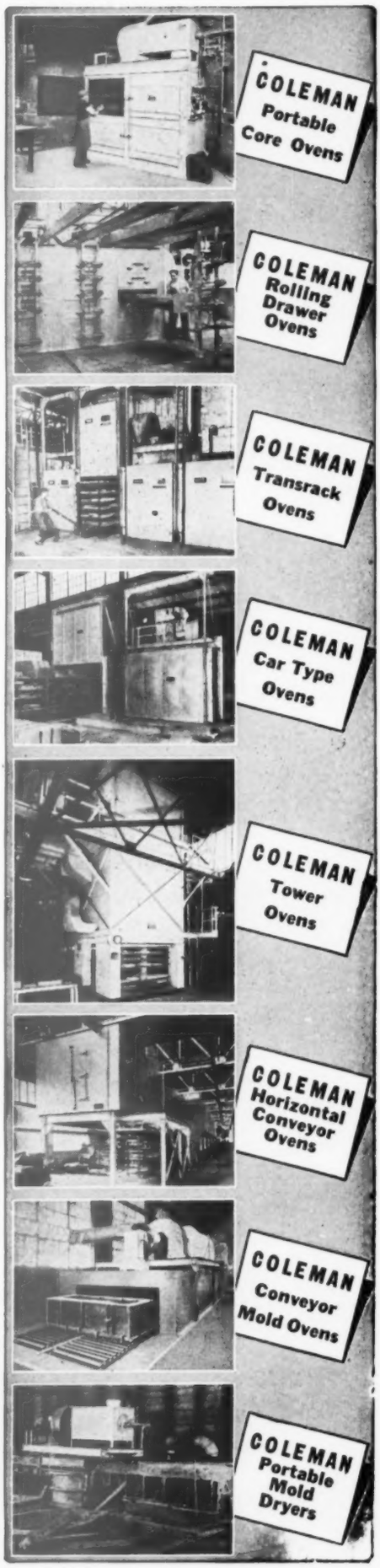
Coleman Conveyor Ovens are built in many different types, each designed to best meet specific operating requirements. These include such designs as Tower Ovens, Horizontal Over-Head Conveyor Ovens, Double-Chain Single or Multi-Pass Conveyor Ovens, Flight-Conveyor Ovens, Combination Vertical and Horizontal Conveyor Ovens, etc.

● ***Why not profit by our extensive experience which includes 40 years of specialization in designing and building foundry ovens? An investigation of a Coleman Conveyor Oven to best meet your needs may disclose an opportunity to obtain important saving in production costs.***

Coleman Ovens are also built in all conventional and special designs to meet every possible requirement in core baking and mold drying. Heating systems can be furnished to use the most economical fuel available in your locality—gas, oil, stoker coal, powdered coal, electricity, etc.

**OVER 8,000 SUCCESSFUL INSTALLATIONS**

***For further information, write for "Folio of Bulletins"***




**EQUIPMENT Company**

**HIO, U. S. A.**

MEMBER

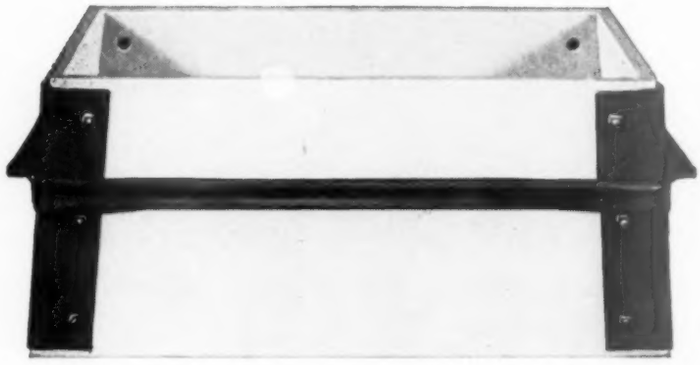
**ND SWARTWOUT OVENS**

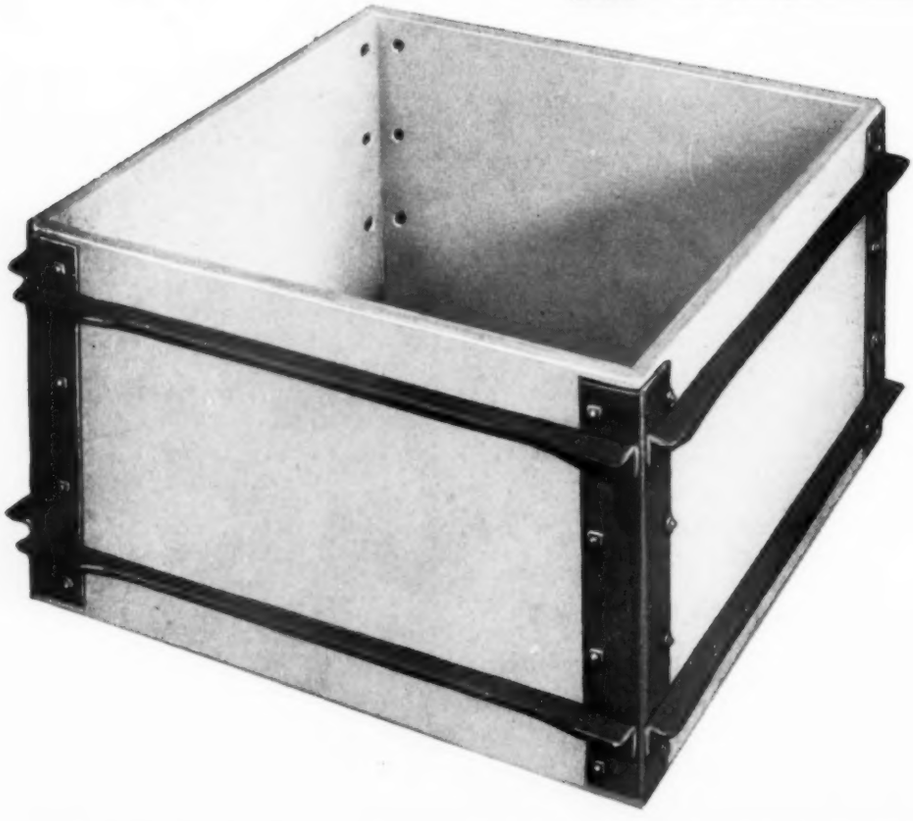
# NON-BURN NON-WARP SLIP JACKETS

## *Runouts—Spillover*

**Will Not AFFECT CMD JACKETS**

**SMOOTH FIT NON-STICKING STRIPS CLEAN**





ON JACKETS UP TO 8" DEEP Single Angle Iron Is Used As Illustrated

ON JACKETS OVER 8" DEEP—Double Angle Iron Reinforcements Are Used

**FOR MORE INFORMATION WRITE FOR CIRCULAR!**

**CHICAGO MANUFACTURING & DISTRIBUTING CO.**

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See that trademark? It appears on every WEMCO ingot, signifying the pride we feel in our product. To you it signifies dependable metal, uniformly the highest quality, the kind of metal you will take pride in using in products bearing your name. For Brass, Bronze and Aluminum of uniformly highest quality, specify WEMCO Ingots.
WMC
WMC
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## Aluminum Research Institute

111 West Washington Street, Chicago 2, Illinois

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5/16"-3/8"-1/2"-5/8"-3/4"-1" Thick

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**ONE DAY DELIVERY . . . ORDER BY FLASK SIZE**
**IF SQUARE GIVE OVERALL SIZE**

- Annealed Glass
- Tough and Durable—Will stand very rough usage
- ¼" Replaceable Wood Dowel Wiping Bar
- Large, well spaced Handle
- Capacity—approx. 1½ quarts
- Diameter Pot at top—6 inches
- Height of Pot—5½ inches
- Height Overall (Pot and cap) 11 inches
- Packed one in carton

Price Each ..... $3.25

***Keeps your shellac clean—will not discolor because it does not come in contact with any metal.***

SEND for special Dowmetal Pattern Plate pamphlet showing sizes and prices. Made in any size or style and shipped the same day order is received. We are listing prices of a few of the thousand sizes we can furnish from stock.

| FLASK SIZE | THICKNESS 5/16" | 3/8" | 1/2" |
|---|---|---|---|
| 10 x 12 | $4.10 | $4.90 | $ 6.55 |
| 11 x 14 | 4.90 | 5.90 | 7.85 |
| 12 x 14 | 5.30 | 6.35 | 8.45 |
| 12 x 18 | 6.30 | 7.55 | 10.10 |
| 13 x 14 | 5.65 | 6.80 | 9.10 |
| 13 x 17 | 6.50 | 7.80 | 10.35 |
| 14 x 14 | 6.05 | 7.25 | 9.65 |
| 14 x 20 | 7.80 | 9.35 | 12.45 |
| 15 x 15 | 6.75 | 8.10 | 10.80 |

| FLASK SIZE | THICKNESS 3/8" | 1/2" | 5/8" |
|---|---|---|---|
| 16 x 16 | $ 8.95 | $11.95 | $15.00 |
| 17 x 17 | 9.85 | 13.15 | 16.50 |
| 18 x 18 | 10.80 | 14.40 | 18.00 |
| 20 x 20 | 12.85 | 17.10 | 21.50 |
| 22 x 22 | 15.00 | 20.00 | 25.00 |
| 24 x 24 | 17.50 | 23.25 | 30.00 |
| 26 x 26 | 20.00 | 26.50 | 33.50 |
| 28 x 28 | 22.75 | 30.25 | 38.00 |
| 30 x 40 | 32.50 | 43.25 | 55.00 |

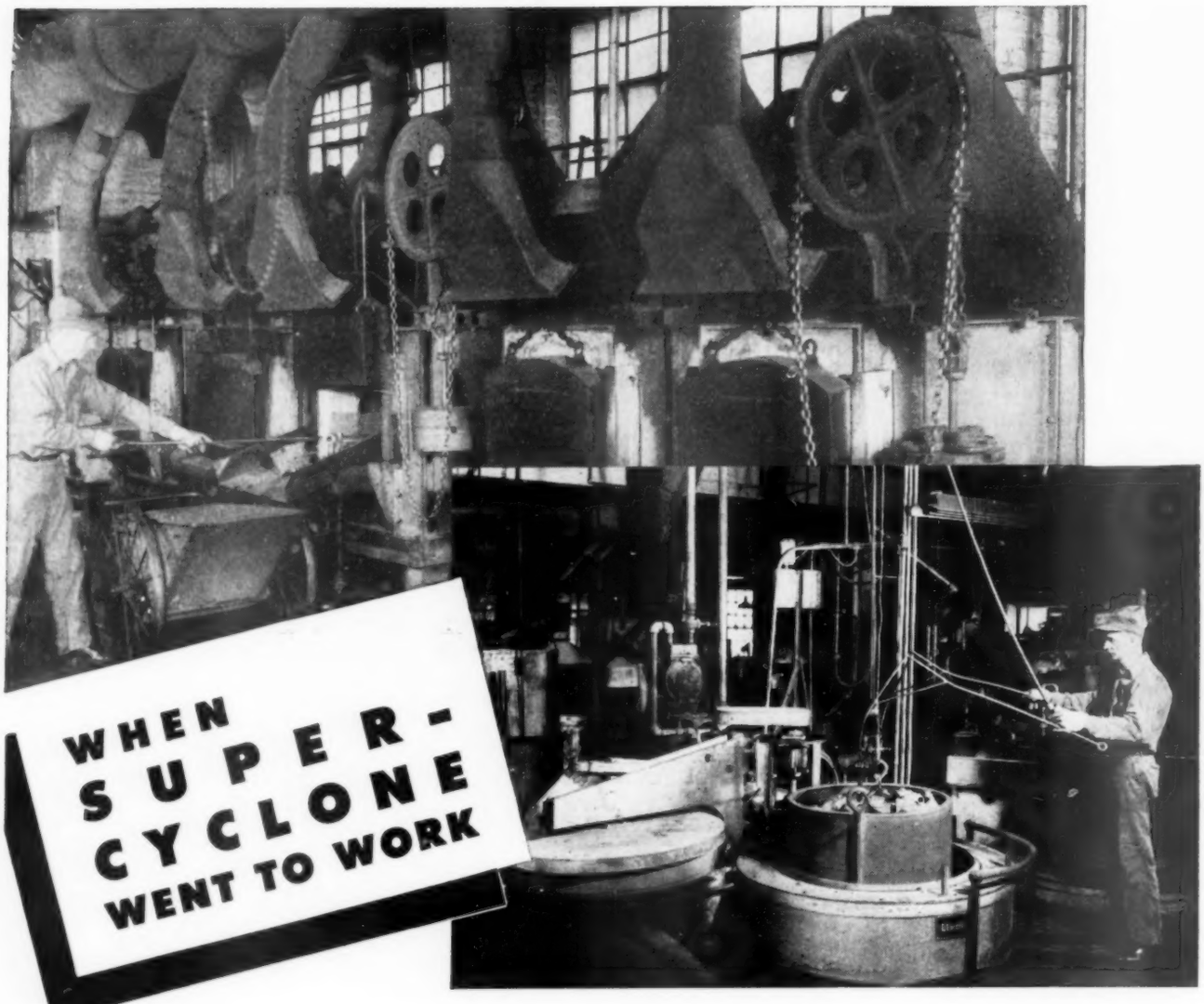
***WE ALLOW 1" FOR FLASK AND 2½" ON EACH END FOR PINS AND EARS***

# The Freeman Supply Company

*Pattern Shop & Foundry Supplies & Equipment*

Mahogany and Pine Pattern Lumber

1152 East Broadway — TOLEDO 5, OHIO — Tel. TAylor 4624




## 8 WASTEFUL BOX FURNACES JOINED THE UNEMPLOYED!

No, it's not done with mirrors. Here are the facts about one large manufacturer's success with the Lindberg Super-Cyclone. Installed to anneal grey iron castings, this *one* furnace replaced *eight* box types.

Requiring only one-sixth as much floor space, the Super-Cyclone doubled this plant's production capacity and saved entirely the labor of individual handling of castings. Loaded into a basket, charged into the furnace in one operation, then dumped after annealing . . . that's the Super-Cyclone way.

Here's an economy of manpower, space and time that writes extra profits into your ledgers in bold, black letters.

This high-speed efficiency is possible because a large volume of accurately heated air is forced through the load at high velocity from an isolated heat source.

The Super-Cyclone's 300° to 1700° F. temperature-range effectively and economically normalizes, hardens, anneals, tempers.

Write for complete information on how the Super-Cyclone can increase your heat treating efficiency . . . and decrease your costs.

**LINDBERG ENGINEERING COMPANY**
2453 WEST HUBBARD STREET, CHICAGO 12, ILLINOIS

ARMY E NAVY

# Lindberg FURNACES

**SUPER-CYCLONE** for hardening, normalizing, annealing, tempering
**CYCLONE** for accurate, low-cost tempering and nitriding
**HYDRYZING** for scale-free and decarb-free hardening

## MULTIPLY OUTPUT

As this small air-operated bench rammer dances rapidly over the foundry mold, tamping the sand firmly into place, it is really multiplying output. More work is produced with less effort and the uniform blows of the tamper produce a higher quality job.

There are several factors that make this possible...To begin with fatigue is reduced to a minimum because the lightweight rammer, not the man, does the work. The easy-holding qualities of this air tool, combined with positive throttle control, enable him to do the tamping quickly and get on with the rest of the operation.

In addition to multiplying your tamping output,* I-R Air Tools are available to help you do the same thing with many other operations such as – drilling, reaming, riveting, chipping, scaling, hoisting, digging, nut-running, etc. Whether the job is large or small, we have an Air Tool for it. Ask one of our Service Engineers to help you make a selection.

**The I-R line also includes floor rammers and backfill tampers.*

**Ingersoll-Rand**

11 BROADWAY, NEW YORK 4, N. Y.

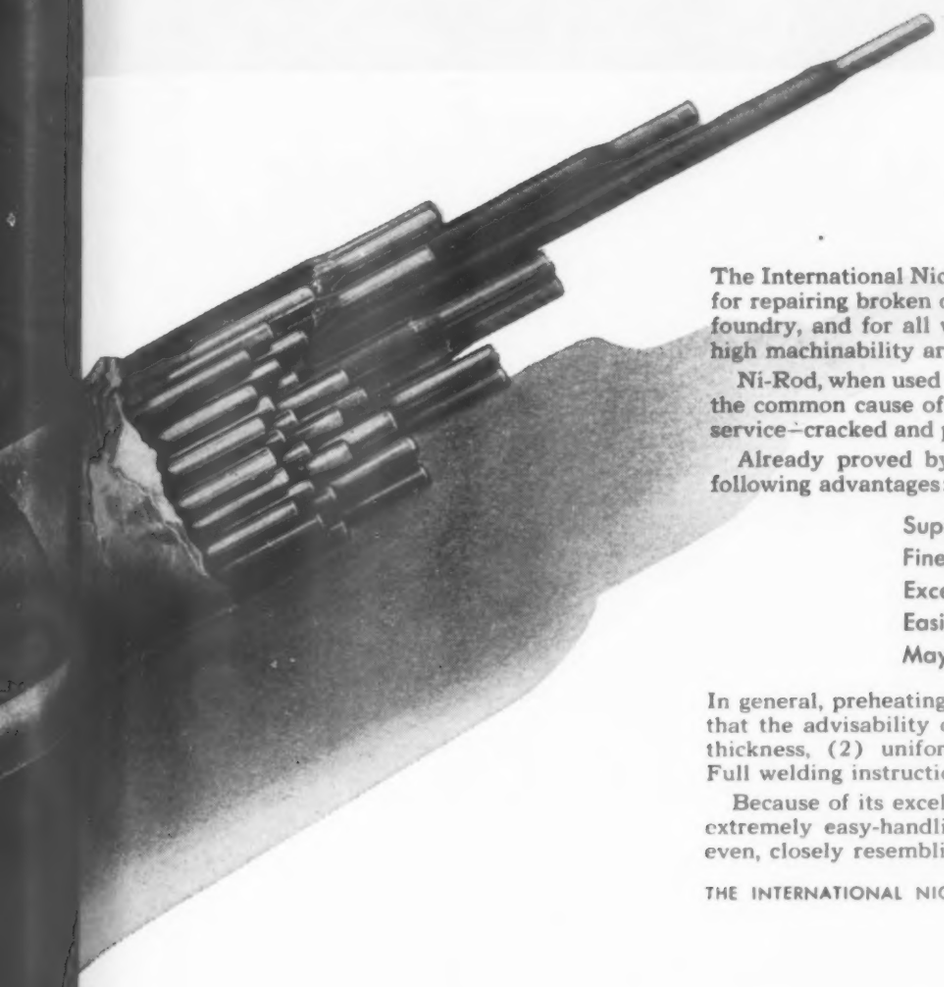
8-562

COMPRESSORS · CONDENSERS · TURBO BLOWERS · CENTRIFUGAL PUMPS · ROCK DRILLS · AIR TOOLS · OIL AND GAS ENGINES

# Announcing

TRADE INCO NI-ROD MARK

# the new NI-ROD welding electrode for machinable welds in cast iron



The International Nickel Company has developed the Ni-Rod electrode for repairing broken or worn castings, remedying casting defects in the foundry, and for all welding work on cast iron where sound welds of high machinability are essential.

Ni-Rod, when used according to recommended procedures, eliminates the common cause of complaint found in an electrode for this type of service—cracked and porous welds.

Already proved by extensive tests in the field, Ni-Rod offers the following advantages:

Superior arcing characteristics
Fine wash
Excellent bead contour
Easily removable slag
May be used on either A.C. or D.C.

In general, preheating is not required. However, experience has shown that the advisability of preheating will be determined by (1) casting thickness, (2) uniformity of cross-section and (3) stress involved. Full welding instructions are in every package.

Because of its excellent arcing and flow characteristics, Ni-Rod is an extremely easy-handling electrode. Its weld deposits are smooth and even, closely resembling the color of cast iron.

THE INTERNATIONAL NICKEL COMPANY, INC., 67 Wall Street, New York 5, N. Y.

## NI-ROD IS DISTRIBUTED BY:

**ATLANTA 3, GA.**
J. M. Tull Metal & Supply Co.
285 Marietta Street

**BALTIMORE 17, MD.**
Whitehead Metal Products Company, Inc.
413 West North Avenue

**BOSTON 41, MASS.**
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235 Bridge St., Cambridge, Mass.

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Whitehead Metal Products Company, Inc.
254 Court Street

**CHICAGO 23, ILL.**
Steel Sales Corporation
3348 South Pulaski Road

**CINCINNATI 14, OHIO**
Williams and Company, Inc.
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**CLEVELAND 14, OHIO**
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3700 Perkins Avenue

**COLUMBUS 15, OHIO**
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Steel Sales Corporation
647 W. Virginia Street

**MINNEAPOLIS 15, MINN.**
Steel Sales Corporation
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**NEW ORLEANS 12, LA.**
Metal Goods Corporation
413 Canal Building

**NEW YORK 14, N. Y.**
Whitehead Metal Products Company, Inc.
303 West 10th Street

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Whitehead Metal Products Company, Inc.
725 Arch Street

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Williams and Company, Inc.
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**PORTLAND 5, ORE.**
Eagle Metals Company
307 New Fliedner Bldg.

**ST. LOUIS 10, MO.**
Steel Sales Corporation
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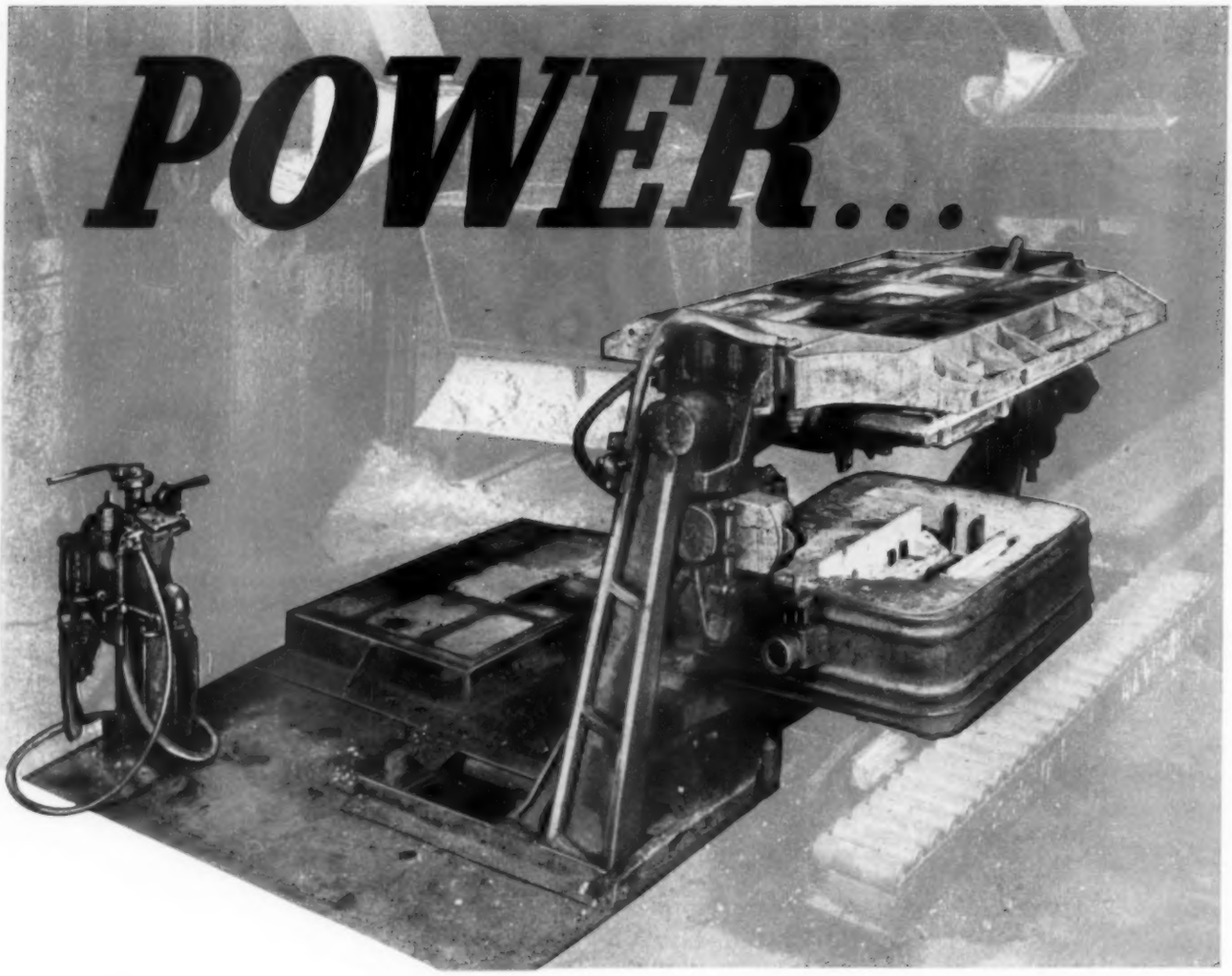
Pacific Metals Company, Ltd.
3100 Nineteenth Street

**SEATTLE 4, WASH.**
Eagle Metals Company
3628 East Marginal Way

**SYRACUSE 1, N. Y.**
Whitehead Metal Products Company, Inc.
242 West Washington Street

**TULSA 3, OKLA.**
Metal Goods Corporation
19 East Cameron Street

*Call or write for more information.*




# FOR MOLDS FAST and ECONOMICAL

POWER—you need lots of it—well directed, to make perfect molds fast and cheap.

Herman Engineers with their research directed solely on molding problems and molding machine design have made a specialty of applying power correctly, smoothly and economically to molding machines. Herman Molding Machines employ fast, sure, powerful, steady hydraulic power... and only Herman Molding Machines give the *patented* roll-over action that provides a complete 180° roll-over with power applied on only 90° of the roll!

Ask to have a Herman Engineer call on you to explain the advantages Herman Molding Machines offer in increasing mold production at lower unit cost—and molds that produce perfect castings.

MEMBER

MOLDING **HERMAN** MACHINES

HERMAN PNEUMATIC MACHINE CO., UNION BANK BUILDING, PITTSBURGH, PA.

# $30,000.00 SAVED YEARLY BY PLANNED DUST CONTROL

WITHOUT a driver the best automobile in the world is worth exactly nothing! It lacks "utility" until it is made to serve a useful purpose.

The same is true of dust control equipment. Unless the highways of its use are charted . . . and unless the course of its operation is directed by resourceful engineers with a weather-eye for storm signals, the short-cuts and improved methods leading to its economic objective are apt to be overlooked.

A case in point is a recent dust control problem that we were invited to work out in a large manufacturing industry. The problem involved the handling of 400,000 cubic feet of air per minute. By recommending a change in process, we were able to effect the saving of 400 H.P. On an annual basis this will show a saving of $30,000 . . . enough to pay for the complete dust collecting system within two years.

We have cited this rather startling, but not altogether unusual, example because it is indicative of the practical approach given by our engineers to dust control projects. It is the type of helpful planning we believe you will want to have in working out your own problems.

**COMPLETE ENGINEERING SERVICE**

Morton I. Dorfan, manager of American's Dust and Fume Engineering Division, heads a staff of resourceful engineers who are qualified by long experience with thousands of dust problems to give constructive assistance. . Mr. Dorfan himself has specialized on dust and fume problems for more than thirty years. We invite you to consult Mr. Dorfan and his staff on your particular problems whenever the need arises.

**WRITE FOR DUST CONTROL BOOKLET**

Here's a booklet that contains just the type of information you need on modern dust control. A copy will be sent to you without charge upon request. Ask for Booklet No. 112.

**American**
FOUNDRY EQUIPMENT CO.
508 SOUTH BYRKIT ST. MISHAWAKA, IND.

**dustube**
DUST COLLECTORS

# The PATTERN SHOP

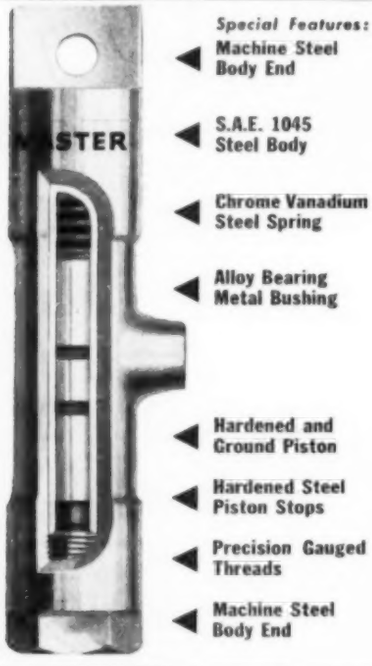
***Pete the Pattern Maker says:***

*"The best way to kill time is to work it to death."*

## MASTER Vibrators

These are heavy-duty vibrators, built to handle the toughest jobs day after day without letdown. MASTER Vibrators will not stick, because the non-corrodible special alloy bronze bearings cannot rust. These bushings automatically provide natural lubrication, entirely eliminating the need for oil.

MASTER Vibrators use less air, because their scientific design establishes a definite relation between the air ports and piston stops, producing a perfectly balanced vibrator operation. All parts are accurately machined or ground to close limits, making them interchangeable. Friction is reduced to a minimum. The special bronze bushing can be readily replaced if worn after long use, restoring full efficiency to the vibrator.




MASTER Vibrators can be adapted to any special equipment, because all body lugs can be machined or drilled to meet the individual needs of various machines or plates requiring special mountings.

Write for descriptive bulletin and prices.

## Distinctive Monograms

Your monogram on your casting is always a mark of distinction, and is an effective advertisement for you wherever your castings are used.

We not only make the regular line of pattern letters and figures but also make anything in the way of special foundry monograms and trade marks, as well as complete alphabets and figures of special design. These can be cast in hard or soft white metal, aluminum or brass.

Mail us your drawing or give us an idea of what you require and we will quote you on the finished product cast from either white metal or brass. Whenever we manufacture special designed letters from your blueprints, we consider the design to be your exclusive property and will not make letters from the design, except for the original owner.

Let us help you make your castings distinctively your own.

*Pete the Patternmaker says: "They say swimming develops poise and grace, but did you ever take a good look at a duck?"*

## MASTER Sheet Wax

MASTER SHEET WAX is a specially compounded material, formulated with the benefit of 25 years of experience in pattern shop needs.

MASTER SHEET WAX is rolled to within a tolerance of .003" over the entire sheet area. It is tough, pliable and plastic, having a high melting point, it never gets sticky, being moisture proof it will not shrink or warp. When heat tempered in warm water, it can be formed to compound curves and stays in place. It cuts free and smooth, and can be welded with little effort. Pattern coatings will dry readily over this material.

MASTER SHEET WAX is used to compensate for metal thicknesses in plaster casting. It is most efficient for building up shell patterns on follow boards, and for lining up over-size core boxes. Write for bulletin of sizes and prices.

We also make MASTER Translucent Sheet Wax for use where fine lines and dimensions must be readily visible through the wax. Assures accuracy and time-saving in mock-up and transfer work. Write for literature and prices.

## MASTER Core Vent Wax

MASTER Core Vent Wax is tailor-made to meet specific and individual needs—for magnesium, ferrous and non-ferrous castings. We have a special formula for magnesium core work. MASTER Core Vent Wax assures you specialized formulas that give maximum results with various core binders, metals and sands. It eliminates blows, reduces scrap, and will step up your profitable output. It is free-flowing, and guaranteed not to affect permeability of the core. Can be furnished hollow or solid, in various shapes and sizes. Only one grade is necessary for summer and winter use.

Hollow Core Vent Wax has from 20% to 25% more footage per pound than solid core vent wax. Send for descriptive bulletins. When writing, specify type of core binder, sand and metal used. We are equipped to handle special shapes and sizes!

## Order Direct

Order all your pattern shop and foundry supply needs direct from Kindt-Collins, for quick delivery of factory-fresh stocks at attractive prices. Write or wire your wants—we can assure you prompt delivery on all obtainable supplies.

## MASTER Wood Dowels

These dowels can be furnished either tight or loose fitting. When ordering, specify the kind desired. They are turned from well-seasoned, straight-grained lumber. Kiln-drying absolutely prevents shrinkage. Write for prices.

## New Rapping Plate Literature

Gives details and specifications on new MASTER Rapping Plates. Get this information now—for better quality of work at lower costs.

KINDT-COLLINS MASTER PRODUCTS

**THE KINDT-COLLINS CO.**

*Everything for the Pattern Shop*

**12651 ELMWOOD AVE. • CLEVELAND 11, OHIO**

# Minimum Maintenance

## IS BUILT* INTO SCHNEIBLE DUST CONTROL EQUIPMENT

The first cost of Schneible Multi-Wash Collectors — although comparable with that of less efficient equipment — is practically the only cost. Every Schneible unit is correctly designed and built for long, trouble-free service.

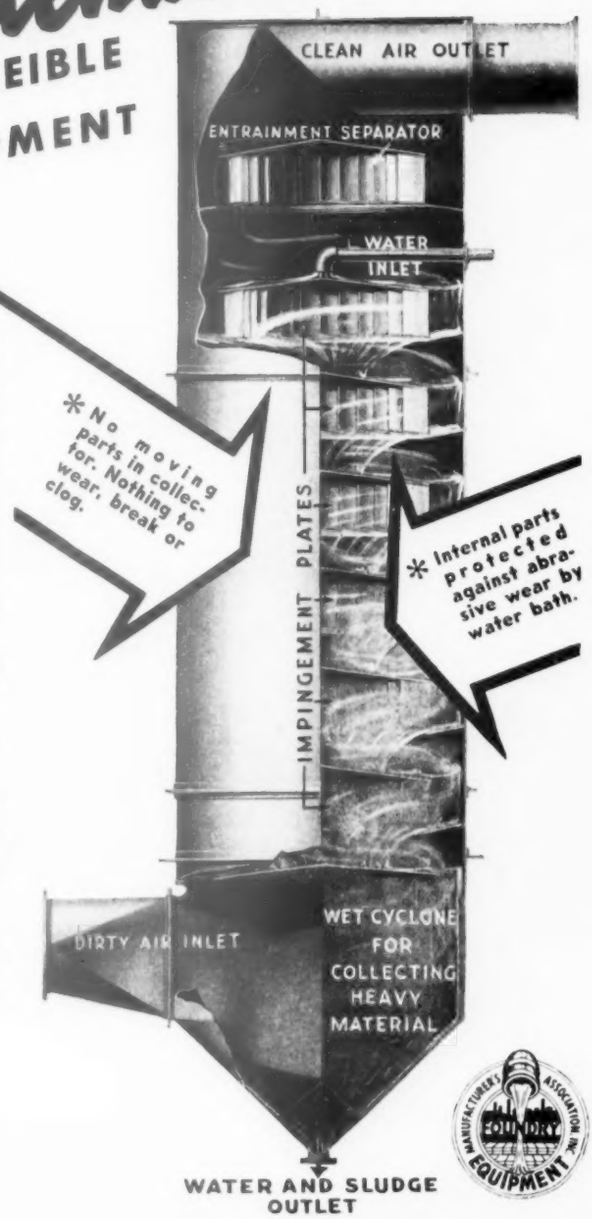
The tower of a Schneible collector, pictured at right, is ruggedly constructed of steel plate — or other material for special requirements. No matter how erosive the material collected may be, all interior surfaces are adequately protected against abrasion by sheets of flowing water, which act as a cushion. There is no appreciable contact between the abrasive material collected and the parts.

There are no moving parts in the air stream — no parts in the Schneible collector which break, burn, clog or rapidly wear.

Consequently, Schneible dust control equipment requires *a very minimum of maintenance.*

In operating cost a Schneible system is likewise lowest. It will function indefinitely with practically no attendance. There are no filters, screens or bags to require periodical cleaning. The collected matter, as sludge, is disposed of far more easily than dust.

One of the prime reasons why so many foundries are installing Schneible Multi-Wash dust and fume collection systems is that they are the most economical in the long run.


CLEAN AIR OUTLET
ENTRAINMENT SEPARATOR
WATER INLET
* No moving parts in collector. Nothing to wear, break or clog.
IMPINGEMENT PLATES
* Internal parts protected against abrasive wear by water bath.
DIRTY AIR INLET
WET CYCLONE FOR COLLECTING HEAVY MATERIAL
WATER AND SLUDGE OUTLET

**CLAUDE B. SCHNEIBLE CO.**

**2827 Twenty-Fifth St., Detroit 16, Mich.**

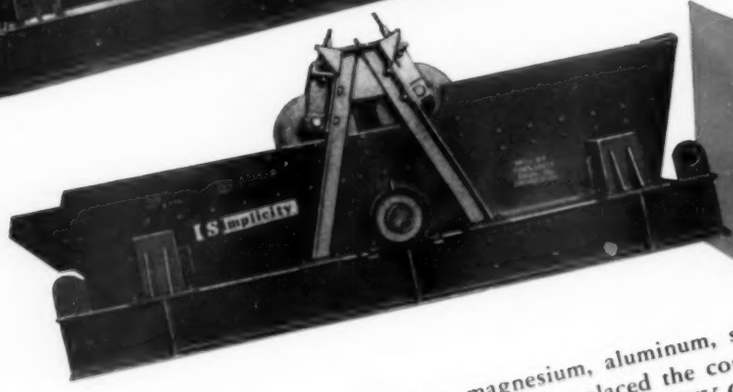
*Engineering Representatives in Principal Cities*

# SCHNEIBLE

LIQUID-VAPOR INTIMATE CONTACT EQUIPMENT for DUST COLLECTION ABSORPTION CONDENSATION AND TEMPERATURE REDUCTION

# PROVEN in operation!...

SIMPLICITY Plate Type, gyrating screen and crushing unit. Used to handle lumps up to 30" in size.



SIMPLICITY Ring Type crusher and gyrating screen unit. Reduces lumps up to 4" in size to grain size.

Many modern foundries producing magnesium, aluminum, steel, malleable iron and gray iron castings, have replaced the conventional type crushers with these highly efficient SIMPLICITY Gyrating Screen and Crushing Unit combinations. These units have been proven successful in foundry operations, involving both core and molding sand, for several reasons. One unit does both crushing and screening and space requirements are little more than that needed for a screen alone. Positive crushing action is attained and the additional power for crushing is very small compared to the power required to operate the conventional type of crusher. Great economy is achieved due to extremely low maintenance costs and easy replacement of wearing parts. Write us now for full information regarding these modern, efficient and space-saving crushing units.

MEMBER

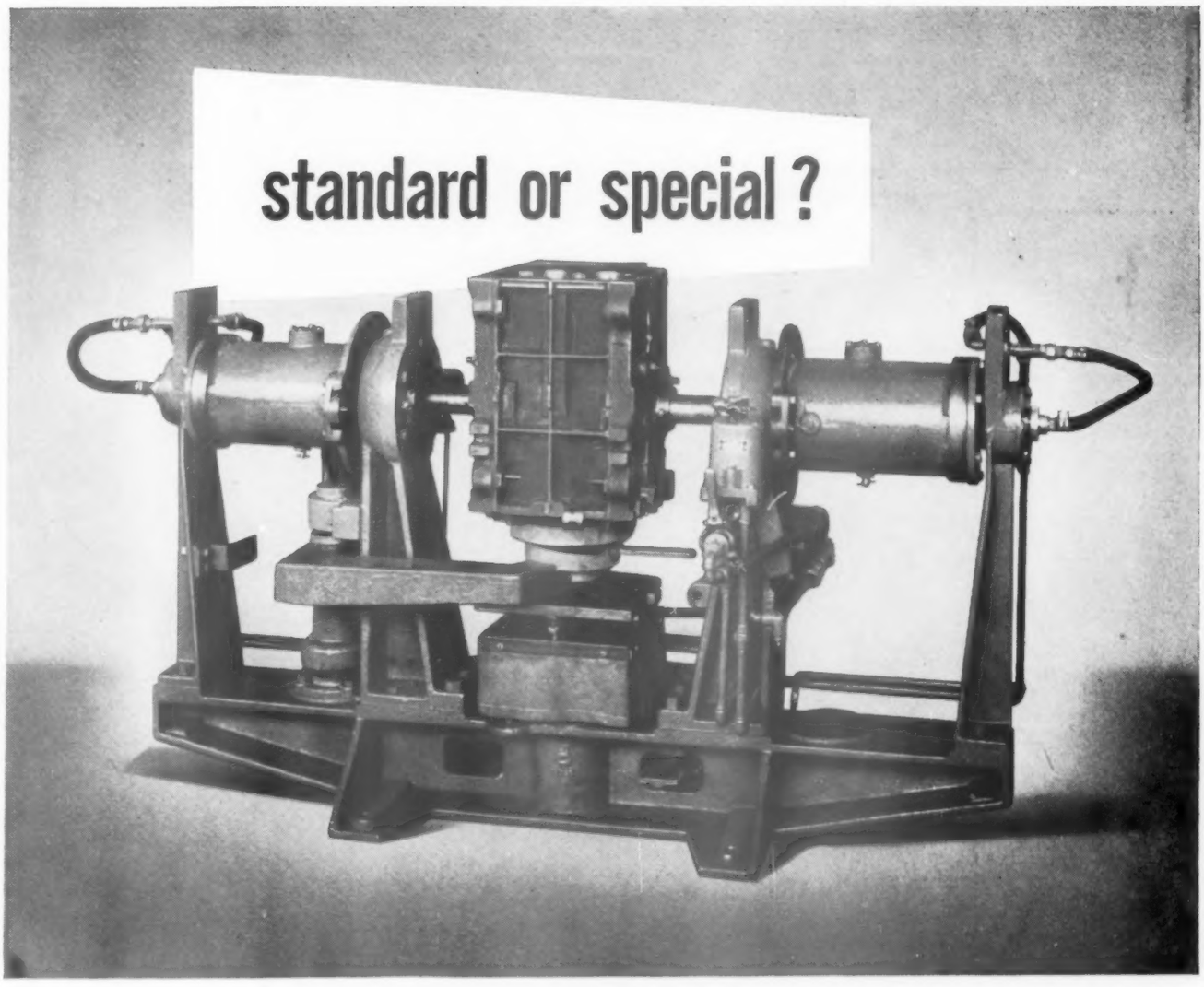
MANUFACTURERS ASSOCIATIONAL INC. FOUNDRY EQUIPMENT

# Simplicity

TRADE MARK REGISTERED

## ENGINEERING COMPANY

DURAND, MICHIGAN




# TABOR FOUNDRY MOLDING MACHINES

This core machine for making barrel cores for cylinder blocks was designed by Tabor to specifications of the user; it is one of 40 built for a large motor car manufacturer.

We can take care of both your special and standard molding machine requirements. We have been designing, building and adding to the Tabor line for over 60 years, keeping pace with changing foundry practice. Tabor offers the right type of machine for any molding need. Write for bulletins descriptive of any of the following:

*SQUEEZERS and JAR SQUEEZERS • HINGED and TRUNNION ROLLOVER MACHINES • JAR and JAR SQUEEZE FLASK LIFT MACHINES • PLAIN and SHOCKLESS JAR MACHINES*

*SPECIAL MOLDING MACHINES*
*TABOR-BRASIVE CUTOFF MACHINES*

MEMBER

FOUNDRY EQUIPMENT MANUFACTURERS ASSOCIATION, INC.

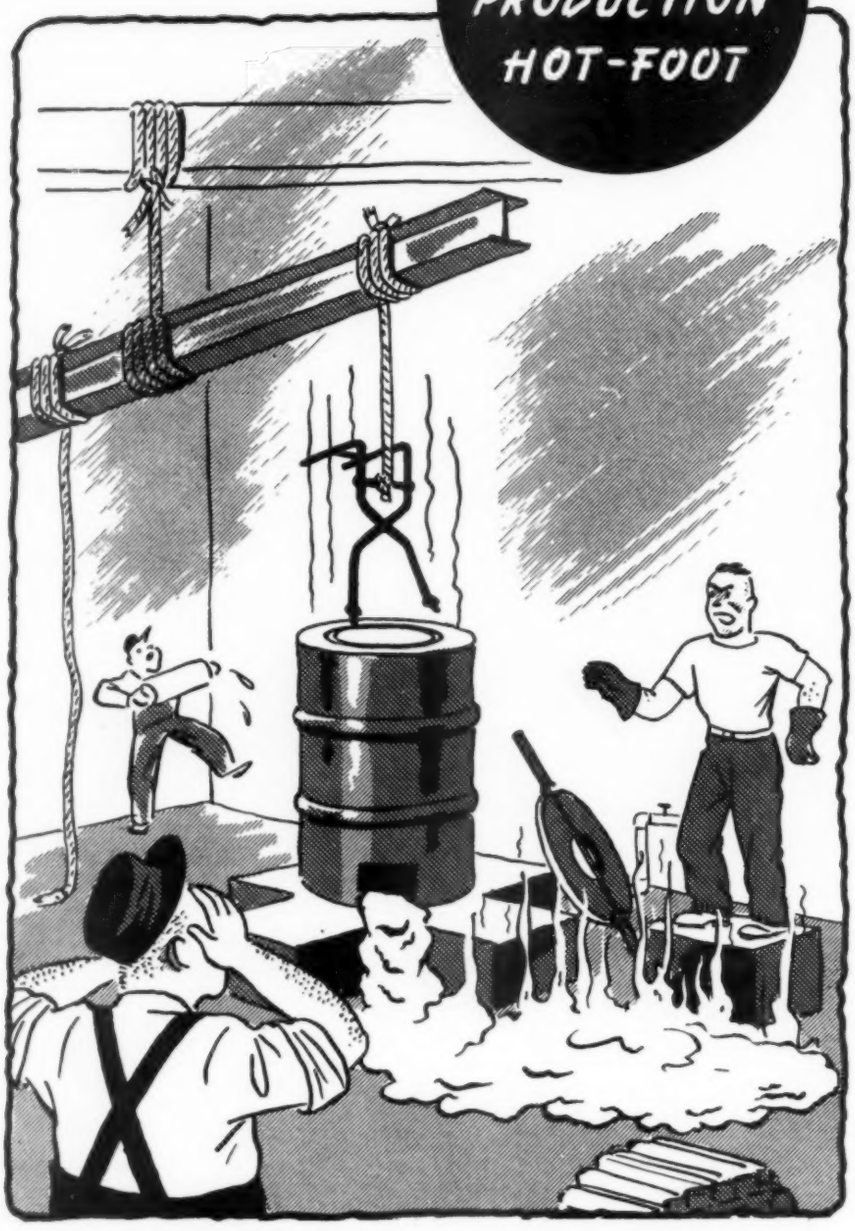
***Since 1884*** . . . MANUFACTURERS OF FOUNDRY MOLDING MACHINES

## THE TABOR MANUFACTURING CO.

**6225 Tacony Street • Philadelphia 35 • Pennsylvania**

**Representatives:** Snyder Foundry Supply Company, Los Angeles, Calif.; Daniel Gallagher T. M. & R. Company, San Francisco and Oakland, Calif.; Carl F. Miller & Company, Seattle, Wash.

# DON'T RISK A PRODUCTION HOT-FOOT



**IKE:**—Here we go again—the boss and his economy

**MIKE:**—Economy? Nuts—the word is "atrocities!" We'll never meet competition with these regular hot-foots, and all their waste. He should ask Fisher for the right equipment and the co-ordination of that equipment to our plant and production requirements for true economy.

*That's right—consult Fisher on all your non-ferrous metal melting problems*

**FURNACES BY** *Fisher*

***Ask for Catalog of Complete Fisher Line***

**FISHER FURNACE COMPANY, 5519 N. Wolcott Ave., Chicago 40, Ill.**

# Electro HIGH-SPEED CUT-OFF WHEELS

# THIN · · STRONG · · FAST

***So thin*** they *whiz* through hard or soft, heavy, light, wet or dry conditions, ferrous and non-ferrous metals and ceramic materials.

***So strong*** they assure safety to men and materials and reduce wheel breakage to a rarity.

***So fast*** they reduce minutes to seconds. They cut with unprecedented speed and precision because of wafer-thin contact ahead of the wheel and feather-weight contact along the sides of the cut. The resulting finish from these true-running wheels usually suffices and that saves the time of another operation.

**WHEEL TRUTH**

Precision in processing, bonding and forming of the abrasives, achieves "wheel truth." No spots of varying density or hardness. Maximum uniformity, balance, and minimum width of cut assure long life. Extreme cutting speed increases production.

**WHEEL BALANCE**

Vibration is no problem. Without vibration, side-friction is no handicap. Cool-cutting is certain. Finish on cut-off ends usually suffices, saves the extra operation. Wheel breakage is a rarity.

*For Complete Details, Write On Your Company Letterhead for a Copy of the Most Talked Of Catalog in Industry, Our New Grinding Wheel Catalog-Handbook, No. 645.*

Electro TRADE MARK SINCE 1919

**Electro REFRACTORIES & ALLOYS CORPORATION**

MFRS. • KILN FURNITURE • REFRACTORIES • CRUCIBLES • GRINDING WHEELS

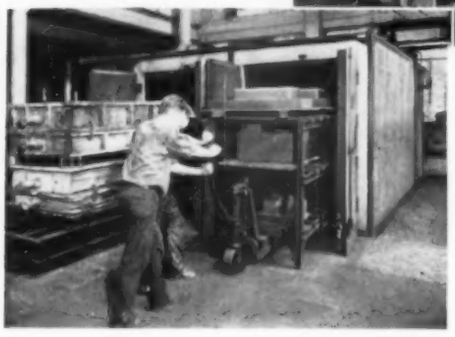
344 DELAWARE AVENUE — West Coast Warehouse Los Angeles — BUFFALO 2, NEW YORK

## ✓ Cores O.K.

# When Uniformly Baked in GEHNRICH OVENS

Multiple pull-drawer type core oven with recirculation heating from an external gas-fired air heater.

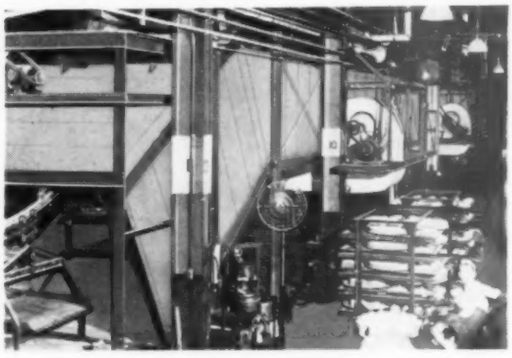
And fast, too, when you do it in a Gehnrich Oven, regardless of whether it's a small batch loading unit or a continuous conveyor type. The correct application of recirculating heating—gas, oil, coke or electric—the Gehnrich way produces better, stronger cores and molds, regardless of size, variety and quantity. Many of the biggest foundries—as well as hundreds of smaller ones—are getting top quality output with Gehnrich Ovens.



Two - compartment core and mold oven with integral oil-fired recirculation heating system.

●

Large continuous monorail - rack core oven with preheating and baking zones and recirculation heating.

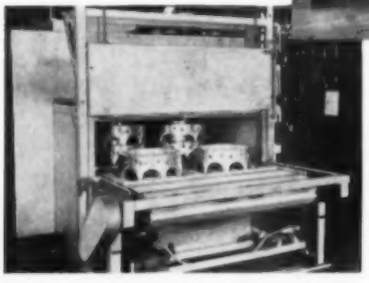


## ✓ Castings O.K.

# When Properly Annealed in ROCKWELL FURNACES

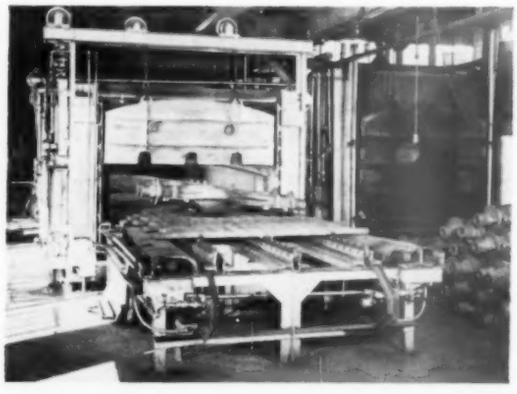
Whether you need an oven furnace type for small castings, a car type for large batches of large or small castings, or a continuous furnace, let Rockwell design the right furnace for your annealing job. In a Rockwell annealing furnace—oil, gas or electric—you are assured of uniform heating of ferrous or non-ferrous castings under the exacting conditions of furnace atmosphere to assure both metallurgical quality and surface appearance.

Battery of oven or hearth type oil-fired furnaces for batch annealing of small castings.



Intermittent conveyor, electric recirculation heated furnace for preheating aluminum castings.

Tray-loading, pusher type, gas-fired furnace for normalizing large axle housings; individual heating of castings has reduced subsequent machining time.



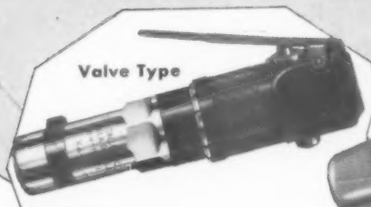
***Write for Catalogs***

**GEHNRICH OVENS • ROCKWELL FURNACES**

**W. S. ROCKWELL COMPANY • 210 ELIOT STREET • FAIRFIELD, CONN.**

# *The* **DALLETT LINE** *of Pneumatic Tools and Accessories*

*Precision Built*



Valve Type

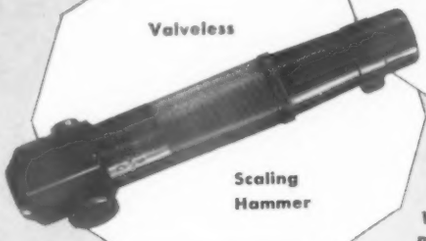
Dallett Valveless

Write for Pneumatic Tool Bulletin No. 100

Chipping Hammer

Safety Retainer Chipping Hammer

Valveless



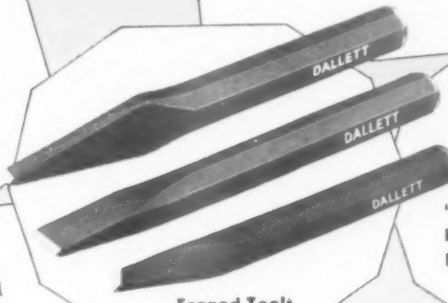
Scaling Hammer

Write for Pneumatic Chisel Bulletin No. 200

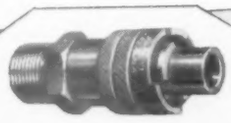
Dallett Pneumatic Tools are made in a number of sizes and designs for many specific uses . . . valve and valveless type, with button, lever or handle control:

Interchangeable

"Dalbo" Hose Ends




Forged Tools



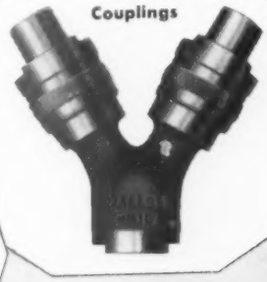
"Dalbo" Interchangeable Pipe Ends

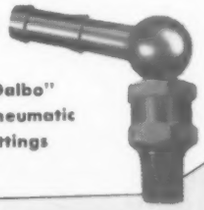
Dallett's—"Dalbo"—Air Hose Fittings and Couplings are machined from solid bar stock—are leakproof—with safety locking sleeve.

Dallett chisels and blanks are made in most standard shanks—safety retainer chisels are available for most makes of small pneumatic tools.

Write for Forged Tool Bulletin No. 210

"Dalbo" Couplings





"Dalbo" Pneumatic Fittings

Write for "Dalbo" Couplings and Fittings Bulletin No. 300

Safety Retainer Chisels

PNEUMATIC DALLETT EQUIPMENT ACCESSORIES

ESTABLISHED 1883

**THE DALLETT COMPANY**

MASCHER AT LIPPINCOTT STREET, PHILADELPHIA 33, PA.

**Manufacturers of Pneumatic Tools and Accessories**

DISTRIBUTORS in principal cities throughout the United States, Canada, Europe and South America.

*Here are some of the ways*

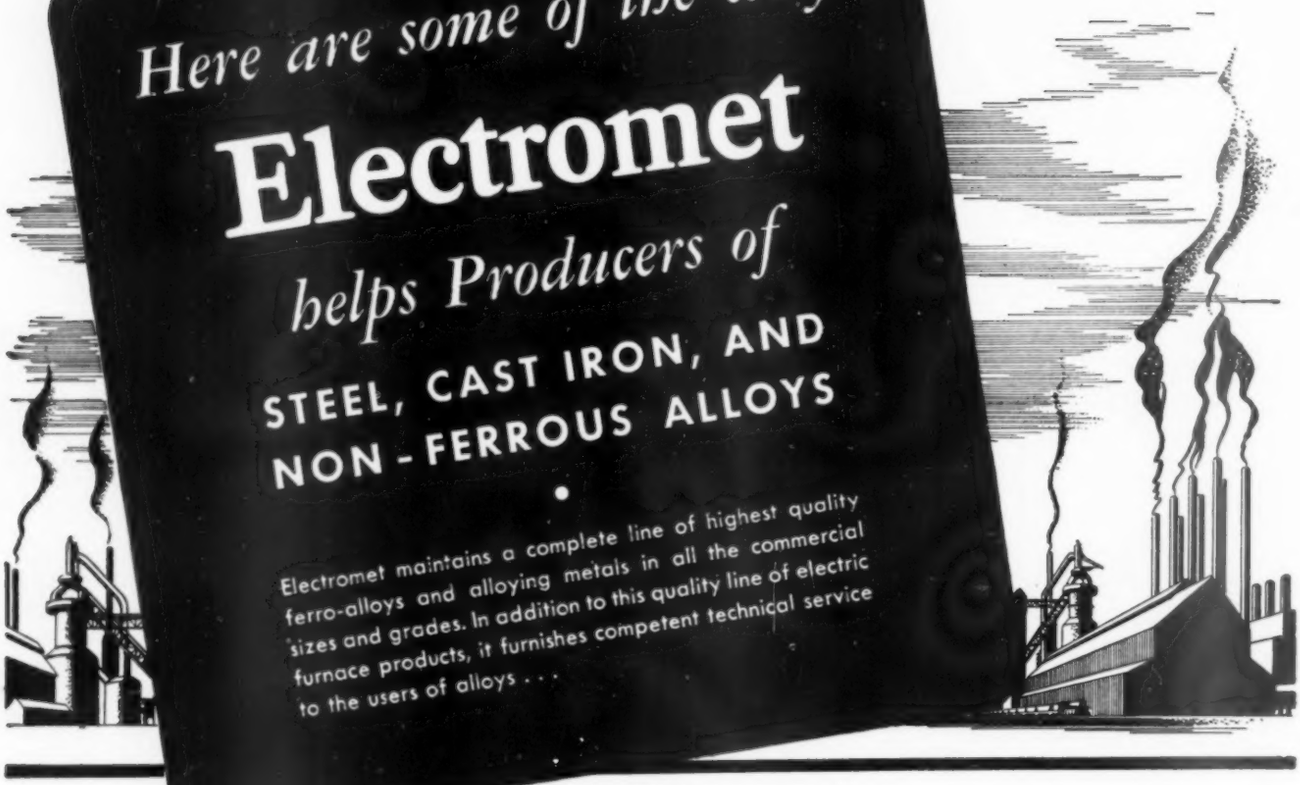
# Electromet

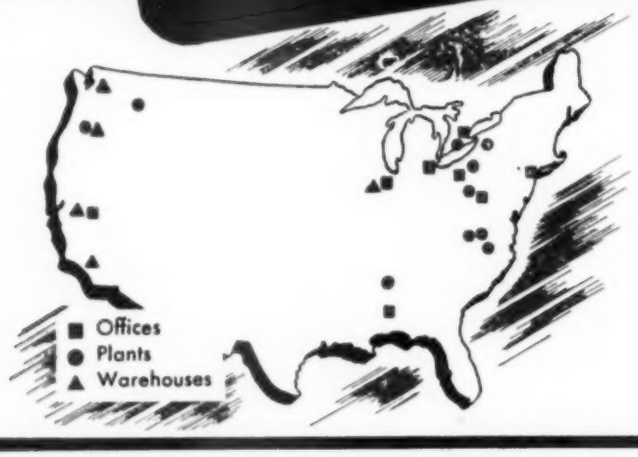
*helps Producers of*

## STEEL, CAST IRON, AND NON-FERROUS ALLOYS

•

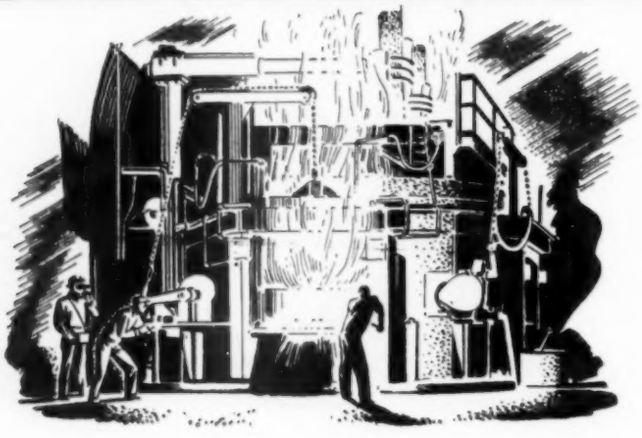
Electromet maintains a complete line of highest quality ferro-alloys and alloying metals in all the commercial sizes and grades. In addition to this quality line of electric furnace products, it furnishes competent technical service to the users of alloys . . .






### STRATEGICALLY LOCATED PLANTS, WAREHOUSES AND OFFICES

Electromet plants are located near the major iron- and steel-producing centers so that prompt delivery is possible. Warehouses in a number of cities supply users who need small shipments quickly. Conveniently located offices make it easy to secure reliable technical information and efficient service.



### SKILLED FIELD METALLURGISTS

Electromet's staff of highly trained metallurgists is constantly available for consultation on the use of ferro-alloys. These men are trained in steel plant and foundry operations and have wide experience in the technical problems involved in the production of steels, irons and non-ferrous alloys.

## GOOD RESEARCH FACILITIES

Field metallurgists are backed up by well-equipped and well-staffed research laboratories which develop new alloys and their efficient application. Pioneers in this work, they have developed low-carbon ferro-alloys, silico-manganese, Silcaz and Silvaz alloys, calcium metal, calcium-silicon, calcium-manganese-silicon, and ferrocolumbium, and others are constantly in process of development.

## TECHNICAL LITERATURE

Electromet makes available many booklets and reprints which are authoritative guides for the use of ferro-alloys in steel plants and foundries. These booklets are based on many years of practical metallurgical experience. Typical titles are: "Chromium in Cast Iron," "Vanadium in Iron and Steel," and "Electromet Products and Service."

## MARKET PROMOTION FOR ALLOY STEELS AND IRONS

Electromet maintains a broad market promotion program for increasing the end-uses of alloy steels and irons. This program includes a consulting engineering service; business paper advertising; a monthly publication, ELECTROMET REVIEW; and numerous booklets.

ELECTRO METALLURGICAL COMPANY
*Unit of Union Carbide and Carbon Corporation*
30 East 42nd Street UCC New York 17, N. Y.

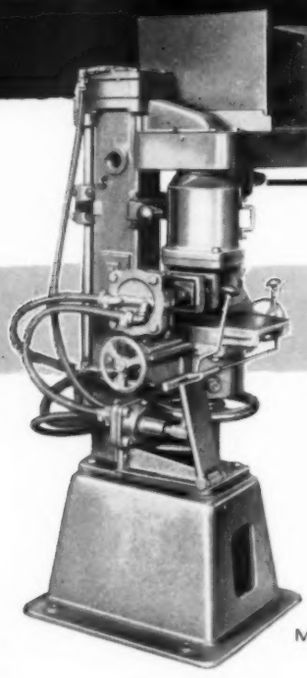
**Electromet**
Trade-Mark
**Ferro-Alloys & Metals**

DISTRICT OFFICES: BIRMINGHAM • CHICAGO • CLEVELAND • DETROIT
PITTSBURGH • SAN FRANCISCO • IN CANADA: ELECTRO METALLURGICAL COMPANY OF CANADA, LIMITED, WELLAND, ONTARIO.

"Electromet," "Silcaz," and "Silvaz," are registered trade-marks of Electro Metallurgical Company.

MODEL 3E

# LARGE OR SMALL



MODEL O

## DEMMLER MACHINES PRODUCE BETTER CORES

Large or small, the best and most economical way to make a core is to blow it—with a DEMMLER CORE BLOWING MACHINE!

Manufactured continuously since 1911, Demmler machines today reflect the years of "know how" acquired building coreblowers that are sturdy, easily adjustable and safe to operate.

DEMMLER users speak highly of the diaphragm valve employed in DEMMLER models. It's efficient, simple—yet trouble-free!

INQUIRIES INVITED

If you are producing cores in commercial quantities, you can do the job better and cheaper with a DEMMLER CORE BLOWING MACHINE. Years of experience qualify DEMMLER in recommending how a core job can be performed with the utmost efficiency and economy. The service is yours for the asking.

SPECIFICATION CIRCULARS ON REQUEST

## *Wm.* DEMMLER *& Bros*

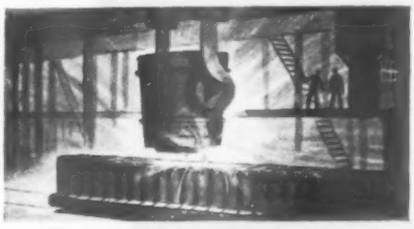
*Kewanee, Illinois*

**MANUFACTURERS OF CORE BLOWERS EXCLUSIVELY SINCE 1911**

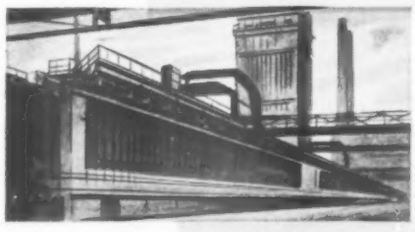
# SPECIFY "GENERAL CHEMICAL"

**PICKLING**—Sulfuric Acid—Hydrofluoric Acid—Muriatic Acid—Nitric Acid—Phosphoric Acid—Chromic Acid.

Detergents: Sodium Metasilicate—Trisodium Phosphate—Sodium Silicate—Tetrasodium Pyrophosphate.



**RIMMING STEEL**—Sodium Fluoride for smoother-surface rimming steel.



**COKE BY-PRODUCTS**—Sulfuric Acid for making ammonium sulphate; also for washing toluene and benzene, and for treating light oils.

**quality chemicals for the metal industry**

Casting Cleaning Acid (Hydrofluoric Acid)—Sodium Silicate—Zinc Chloride—Polyacid Fluoride—Chromic Acid • Ammonium Fluoborate—Sodium Fluoborate—Potassium Fluoborate, Antioxidants and inhibitors • Potassium Fluoride—Lithium Fluoride and Other Welding Fluxes • Fluoboric Acid: Solvent for silica, in cleaning surfaces.

Sodium Cyanide—Sodium Fluoride—Sodium Cyanate—Potassium Cyanate.

Lead Fluoborate—Tin Fluoborate—Zinc Fluoborate—Cadmium Fluoborate—Copper Fluoborate, etc.

FOR METAL ANALYSES: BAKER & ADAMSON REAGENTS AND FINE CHEMICALS

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**40 RECTOR STREET, NEW YORK 6, N. Y.**

*Sales and Technical Service Offices:* Atlanta • Baltimore • Boston • Bridgeport (Conn.) Buffalo • Charlotte (N. C.) • Chicago • Cleveland • Denver • Detroit • Houston • Kansas City • Los Angeles • Minneapolis • New York • Philadelphia • Pittsburgh • Providence (R. I.) San Francisco • Seattle • St. Louis • Utica (N. Y.) • Wenatchee • Yakima (Wash.)

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BASIC CHEMICALS
GENERAL CHEMICAL COMPANY
FOR AMERICAN INDUSTRY

# SAFETY "RITE-SPEED" GRINDERS

## Take the *Guesswork* out of *Grinding*

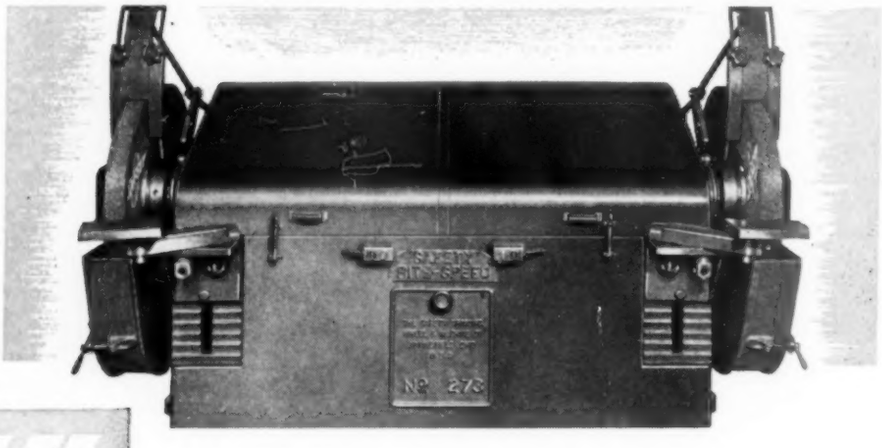
PUT "RITE-SPEED" on the job and the results you get will be exactly what you specified—and practically without thought or concern on your part . . . set the speed at any desired rate and start the Grinder—that's all you need to do!

"RITE-SPEED" then gives you constant, uniform S.F.P.M. as the wheel wears down—the same at the end as at the start of the job. No overspeeding! And "RITE-SPEED" automatically stops when the wheel wears down to a predetermined diameter.

All this only touches upon "RITE-SPEED" cost-cutting, labor-saving, better-grinding benefits. We'll gladly send you the complete story if you say so. We believe you'll find it interesting. Write or wire! Also ask for our new book on Grinding Wheels.

***Also Ask About Other SAFETY Products***

**Swing Frame Grinders**
**Grinding Wheels**
**Floor Stand Grinders**



**SAFETY**
**GRINDING WHEEL AND MACHINE COMPANY**

**Main Office and Factory, Springfield, Ohio**

- Birmingham—3-3323
- Milwaukee—MItchell 0265
- St. Paul—MIdway 4774
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- Pittsburgh—ATlantic 5218
- St. Louis—CEntral 3676
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Ad 5-5

• Sales Offices and • Sales Offices and warehouses for Better Service!

# Mexaloy Super Refractory Saves Linings and Equipment

## Tough, non-fusible protective lining for ladles, spouts, runners and cupolas

Mexaloy is the ideal material for protecting refractory linings of cupolas, ladles, runners and spouts in both foundries and steel plants. Mexaloy makes the body containing it highly resistant to sudden, violent temperature changes and thus avoids spalling and cracking of the refractory. Practically infusible, it will not melt or change its character under the action of molten metal. Neutral and chemically inert, Mexaloy's presence insures resistance to fluxing and corrosive action by molten metals and slags. It provides a low-friction, surface which allows no foreign body adherence.

Mexaloy is extremely easy to apply. Mixed with clay, ground fire brick and water according to a simple formula, the resulting mixture is easily applied by tamping. Linings containing Mexaloy last longer. For example, in the spouts of open Hearth furnaces where the usual loom layer has to be replaced after every one or two heats Mexaloy linings invariably last more than 10 heats—sometimes as many as 30. In Foundry cupolas Mexaloy linings last longer and improve metal quality.

To greatly reduce "shut downs" in your steel plant or foundry due to refractory replacements, it will pay you to use Mexaloy. Write today for further information.

**Mexaloy**

**THE UNITED STATES GRAPHITE COMPANY • SAGINAW, MICHIGA**

Many of the inherent qualities in Gas contribute to its unit and overall economy in use. Further, the research achievements of the American Gas Association and Gas equipment manufacturers in sponsoring advanced apparatus to utilize to the utmost the advantages of this modern fuel, add to its economy.

Among the contributions to economy of Gas application in industrial plants are: *speed*—desired temperatures are attained in shorter time in the Gas furnace; *controllability*—which provides and maintains the precise temperature required; *simplicity*—Gas equipment requires less space, maintenance, attention; *elimination of storage*—Gas requires no capital investment in stored fuels, again saves space; *dependability*—Gas is there when you want it; *uniformity of production and elimination of rejects*—Gas users report that production has been improved, products are superior, seconds or rejects cut to a minimum or eliminated, since switching to Gas.

The economical application of Gas to your specific operations can best be explained by the Industrial Engineer of your local Gas Company. His service is complete, you incur no obligation.

**AMERICAN GAS ASSOCIATION**

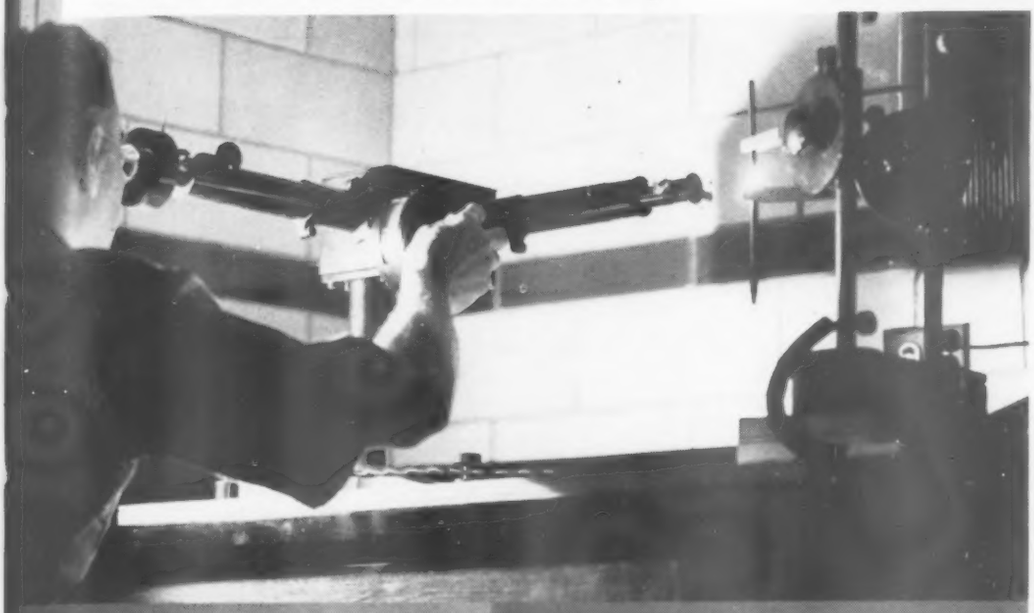
420 LEXINGTON AVENUE, NEW YORK 17, N. Y.

THE TREND IS TO GAS
FOR ALL
INDUSTRIAL HEATING

# TECHNICAL "KNOW-HOW"

*assures*

# PERFECT CASTINGS



A casting is no better than its alloy—an alloy is no better than the laboratory that checks every step in its production and carefully controls its chemical analysis.

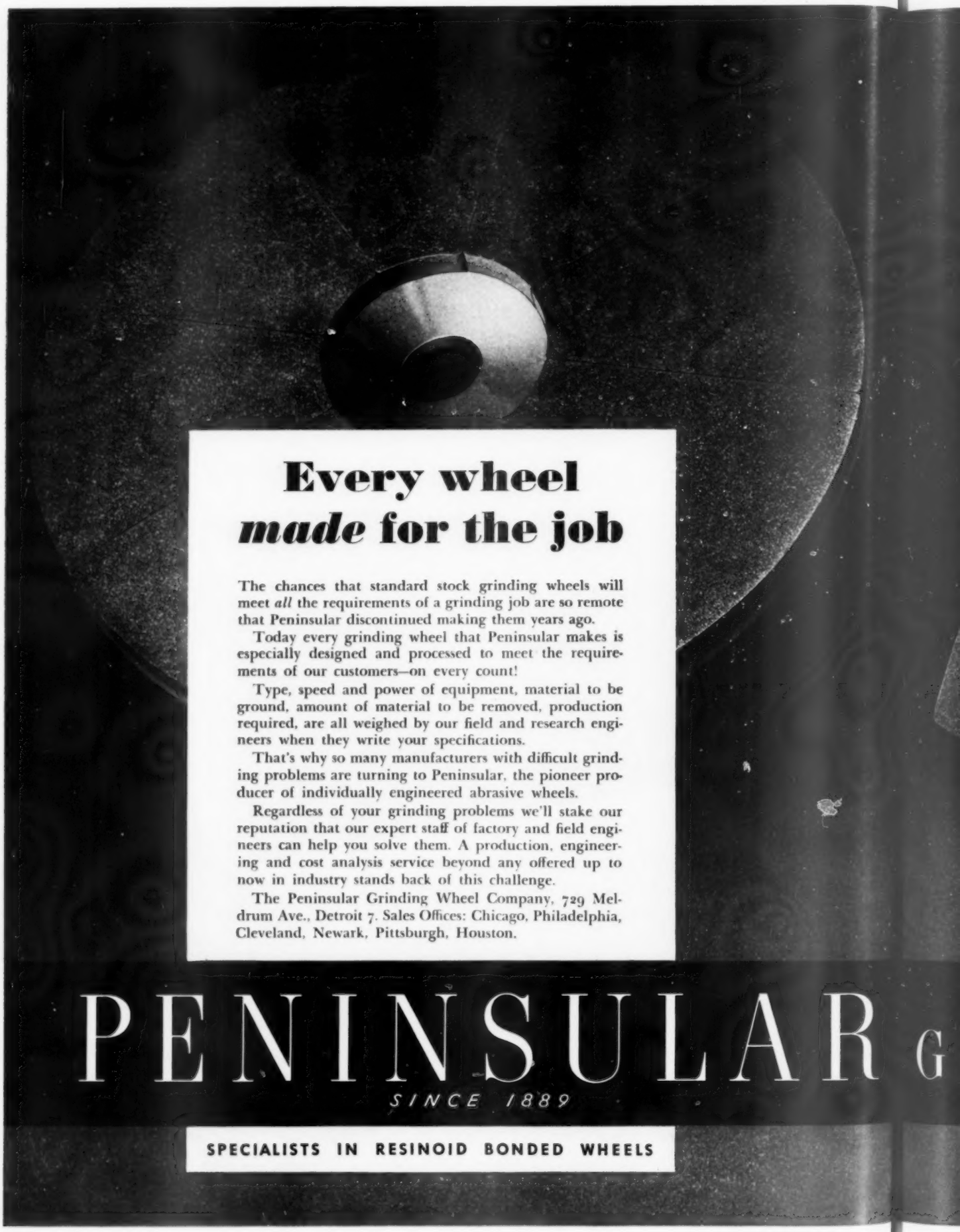
Every **S-G Alloy** produced has back of it the technical knowledge of skilled laboratory men plus the finest, most modern testing equipment available.

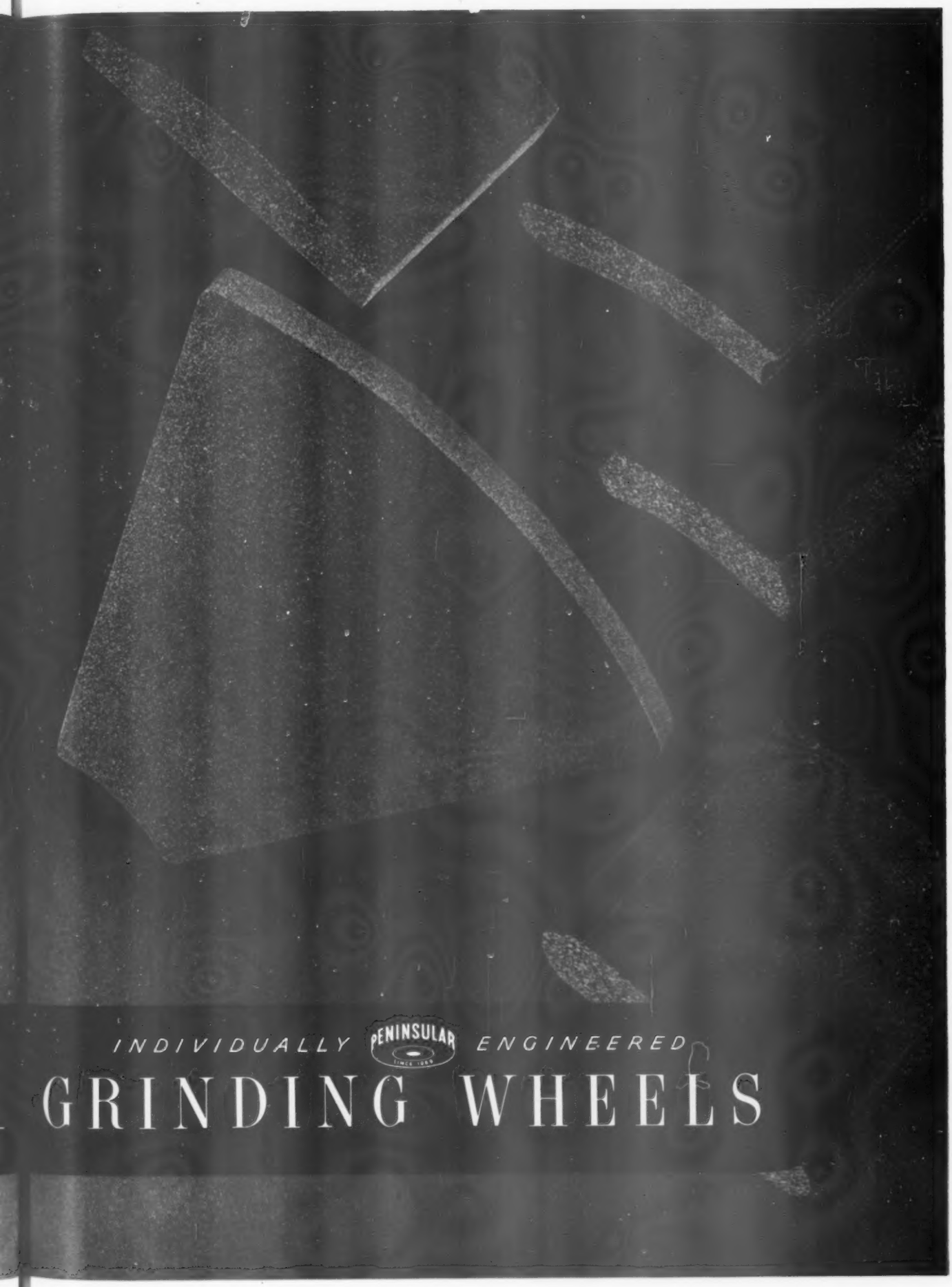
You can rely on **S-G Alloys** to be uniform in quality and to meet your most rigid specifications. If you have a foundry or casting problem you wish solved, write to our Research Service Department. We will be glad to help you.

**SONKEN-GALAMBA** *Corporation*

MEMBER ALUMINUM RESEARCH INSTITUTE

**Riverview at 2nd Street · Kansas City 18, Kansas**


Every wheel
made for the job
The chances that standard stock grinding wheels will meet all the requirements of a grinding job are so remote that Peninsular discontinued making them years ago.
Today every grinding wheel that Peninsular makes is especially designed and processed to meet the requirements of our customers—on every count!
Type, speed and power of equipment, material to be ground, amount of material to be removed, production required, are all weighed by our field and research engineers when they write your specifications.
That's why so many manufacturers with difficult grinding problems are turning to Peninsular, the pioneer producer of individually engineered abrasive wheels.
Regardless of your grinding problems we'll stake our reputation that our expert staff of factory and field engineers can help you solve them. A production, engineering and cost analysis service beyond any offered up to now in industry stands back of this challenge.
The Peninsular Grinding Wheel Company, 729 Meldrum Ave., Detroit 7. Sales Offices: Chicago, Philadelphia, Cleveland, Newark, Pittsburgh, Houston.
PENINSULAR G
SINCE 1889
SPECIALISTS IN RESINOID BONDED WHEELS


INDIVIDUALLY PENINSULAR ENGINEERED
GRINDING WHEELS

**STERLING PATENTED FEATURES**

1. Solid rolled flanges with full-width bearing.
2. Sturdy all-steel webs of ¼" or ⅜" thickness.
3. Solid center reinforcing bars to prevent distortion.

(Patent No. 1974292)



STYLE ⅜ NT-NNT FLASK — 36" x 48" x 14" x 10". Equipped with heavy duty malleable clamps and steel clamping bars.

STLYE ⅜ NN-N FLASK — 38" x 73" x 20" x 18". Equipped with lifting loops instead of trunnions. Double center bar on cope.

STERLING Flasks are made to meet the toughest production schedules! Year in, year out, they retain their rigidity and accuracy under constant production pressure . . . and heaviest production demands. You'll find STERLING Flasks *engineered* for durability and custom-built to meet *your* requirements. For *complete* foundry flask service, consult STERLING.

***STERLING FLASKS ARE USED IN MORE THAN 4000 FOUNDRIES!***

# Sterling FOUNDRY FLASKS

**STERLING WHEELBARROW COMPANY • MILWAUKEE 14, WIS., U. S. A.**

more used
than any other
merchant
pig iron...

P M

Such preference
must be merited

PICKANDS MATHER & CO.

CLEVELAND • CHICAGO • DETROIT • ST. LOUIS
ERIE • DULUTH • MINNEAPOLIS • TOLEDO

• IRON ORE
• PIG IRON
• COAL
• COKE

# A *Real* INVESTMENT FOR MORE PRODUCTION!

## DIAMOND FLASKS

*No matter what happens*—you'll never be wrong if you equip for production with *good* flasks. Because we can give you many exclusive features in a flask developed over a period of 50 years, it can also be said that, "You can't go wrong on a Diamond," either. Note these important features:

- **A SUPERIOR LATCH (exclusive)**

  It's self-compensating for wear. The tighter you draw it, the firmer the grip. Has special cam which is easily adjustable as extreme wear on parts develops. Only *Diamond* has this patented feature.

- **PRECISION-MADE**

  Made from the finest grade of well-seasoned cherry stock, all flasks are made to precise measurements according to your specifications.

- **A PATENTED HINGE (exclusive)**

  Note the construction of Diamond hinges. The lugs are carefully milled and are interlocking which eliminates "play" no matter how long or how hard the flask is used.

- **SPECIAL SHAPES**

  We regularly supply customers with special shape flasks, including round flasks, and special cut partings.

## STEEL JACKETS

Made from Nos. 7 to 10 gauge steel, true to size and taper. Are practically indestructible, and retain their shape under severest conditions. Thousands of these jackets in use.

# DIAMOND

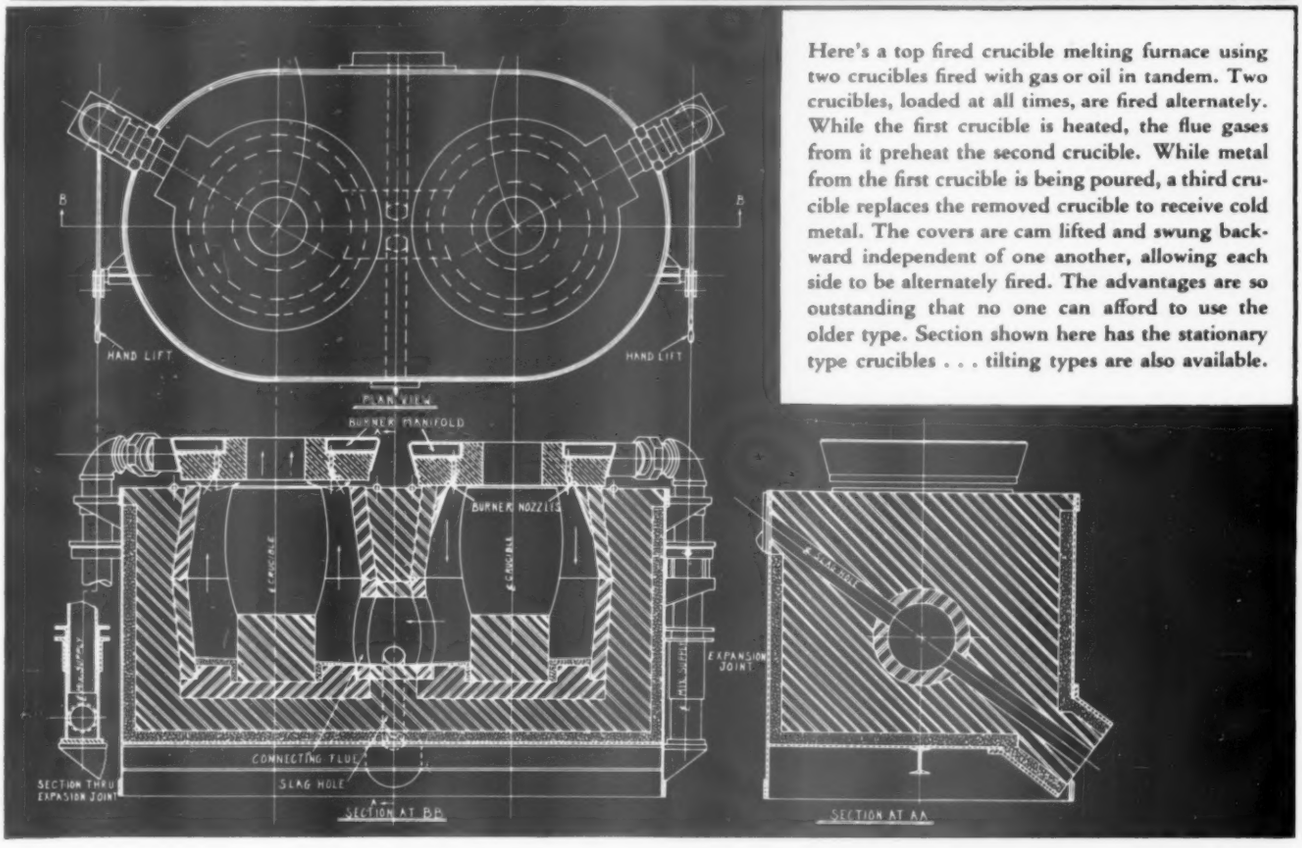
CLAMP AND FLASK COMPANY

Telephone 2553

Richmond, Indiana

*Designers of* CORE PLATES, JACKETS, BANDS, FLASKS *since 1889*

# NEW IT'S DIFFERENT IT'S BETTER NEW




Here's a top fired crucible melting furnace using two crucibles fired with gas or oil in tandem. Two crucibles, loaded at all times, are fired alternately. While the first crucible is heated, the flue gases from it preheat the second crucible. While metal from the first crucible is being poured, a third crucible replaces the removed crucible to receive cold metal. The covers are cam lifted and swung backward independent of one another, allowing each side to be alternately fired. The advantages are so outstanding that no one can afford to use the older type. Section shown here has the stationary type crucibles . . . tilting types are also available.

## 18 REASONS FOR SCRAPPING YOUR OLD CRUCIBLE FURNACES

1. 25 to 30% fuel saved on aluminum and magnesium. 40 to 50% fuel saved on brass and copper.
2. 50 to 100% longer pot life.
3. 50 to 100% longer lining life.
4. 50 to 100% longer cover life.
5. 50 to 100% longer burner life.
6. Easy to charge. (No flame through cover)
7. Far lower metal loss. (Flame does not impinge on metal)
8. Faster heating. (Combined radiant and convection heating)
9. Less slagging. (Less slagging and no slag build up possible)
10. Lining is easy to replace. (No burner ports)
11. Burners easy to inspect and replace. (Change in 15 minutes)
12. Burners cannot plug. (Burners in top where slag or metal cannot reach them)
13. Pure metal. (Neutral pressure on metal surface allows charcoal or atmosphere to be used)
14. Furnace can be flued through the floor to the outside, eliminating heat and gases in foundry.
15. No leakage of cover. (No flame through or around cover)
16. Quiet operation.
17. Unobstructed flueing. (Flued at bottom and charge does not affect it)
18. Metal is visible at all times and temperature can be taken at any time, without shutting off burners.

**RADIANT COMBUSTION, Inc.**

BUILDERS OF EVERY TYPE (OIL, GAS, ELECTRIC) OF HEAT TREATING FURNACE

WARREN . . OHIO

RADIANT COMBUSTION, Inc.
WARREN . . OHIO

*Please give us further information*

Company_____

Your Name_____

Address_____

City_____ State_____

# JEFFREY MOLD CONVEYOR CARS ROLL ON TIMKEN BEARINGS

Photograph courtesy of The Jeffrey Mfg. Co., Columbus, Ohio.

The Jeffrey Continuous Pouring System for foundries uses continuous power-driven car-type conveyor units for carrying the molds, as shown in the photograph.

It is important that these cars travel smoothly and steadily on the track; any jerking or "walking" motion would tend to break down the molds, or possibly to disturb the metal in the mold.

To assure this vital running smoothness, The Jeffrey Manufacturing Company has taken three precautions: (1) the use of heavy T-rail track, (2) large diameter, chilled-tread wheels, tread-ground, (3) mounting the wheels on Timken Tapered Roller Bearings.

Besides assuring smooth operation, the use of Timken Bearings is a strong factor of endurance, dependability and economy, for friction and wear are banished; power is conserved; radial, thrust and combined loads are carried with a wide margin of safety.

Make sure of getting Timken Tapered Roller Bearing advantages *in full;* see that the trade-mark "TIMKEN" appears on every bearing you use.

**TIMKEN**
TRADE-MARK REG. U. S. PAT. OFF.
**TAPERED ROLLER BEARINGS**

**THE TIMKEN ROLLER BEARING COMPANY, CANTON 6, OHIO**

Your post war MACHINE TOOL and INDUSTRIAL EQUIPMENT needs can be solved

# THIS SURPLUS EQUIPMENT is available through RFC

The first problem of reconversion facing private industry today is the problem of getting machines in motion as soon as possible.

The vast stock pile of government owned surplus tools of every description being released to industry can help you reconvert. It is the job of the Reconstruction Finance Corporation to dispose of this surplus property quickly and effectively. Toward that end we ask you to follow this simple 3 step procedure:

1. **Submit in writing your requirements for machine tools and industrial equipment to us now.**
2. **Send a typewritten list to your nearest R.F.C. Regional Office listed below.**
3. **Make your descriptions brief, one line if possible, clearly grouping various types of equipment you need.**

The supply of industrial equipment and machine tools is sufficient to meet most of the needs of industry . . . as this partial listing indicates. Our job is to get these tools in your hands as speedily and easily as possible. The 31 strategically located offices below are ready to help you reconvert.

## A CHECK LIST OF SURPLUS INDUSTRIAL EQUIPMENT AVAILABLE THROUGH RFC

*Check the types of equipment on which you desire further and continuing information. Mail to your nearest RFC office listed below. Your name will be placed on our regular mailing list.*

**MACHINE TOOLS**

- ☐ Boring Mills
- ☐ Broaching Machines
- ☐ Turret Lathes
- ☐ Drilling Machines
- ☐ Gear Cutting and Finishing
- ☐ Grinding Machines
- ☐ Lathes
- ☐ Milling Machines
- ☐ Shapers and Slotters

**INDUSTRIAL EQUIPMENT**

- ☐ Hydraulic Presses
- ☐ Woodworking Machinery
- ☐ Electric Welding Equipment (Arc or Resistance Types)
- ☐ Heat Treating Furnaces
- ☐ Inspection Testing and Measuring
- ☐ Conveyors
- ☐ Gas Welding and Cutting Equipment
- ☐ Engine Driven Generator Sets
- ☐ Process Control Recording Instruments
- ☐ Electrical Switch Gear
- ☐ Miscellaneous Metal Working Machinery

**The following surplus equipment is also available in various makes and *LARGE QUANTITIES* . . .**

- ☐ Ball and Roller Bearings
- ☐ Abrasives, Basic Products (Grinding Wheels)
- ☐ Cutting Tools for Machine Tools (Drills, Reamers, Milling Cutters)

NAME. . . . . .

TITLE. . . . . .

COMPANY. . . . . .

ADDRESS. . . . . .

***We want to make it easy to do business with RFC. If you desire, credit terms can be arranged. If your local office does not have all the equipment you need, they will endeavor to locate it from other offices throughout the country.***

# RECONSTRUCTION FINANCE CORPORATION

***A Disposal Agency Designated by the Surplus Property Administration***

**Agencies located at: Atlanta • Birmingham • Boston • Charlotte • Chicago • Cleveland • Dallas • Denver Detroit • Helena • Houston • Jacksonville • Kansas City, Mo. • Little Rock • Los Angeles • Louisville Minneapolis • Nashville • New Orleans • New York • Oklahoma City • Omaha • Philadelphia Portland, Ore. • Richmond • St. Louis • Salt Lake City • San Antonio • San Francisco • Seattle • Spokane**

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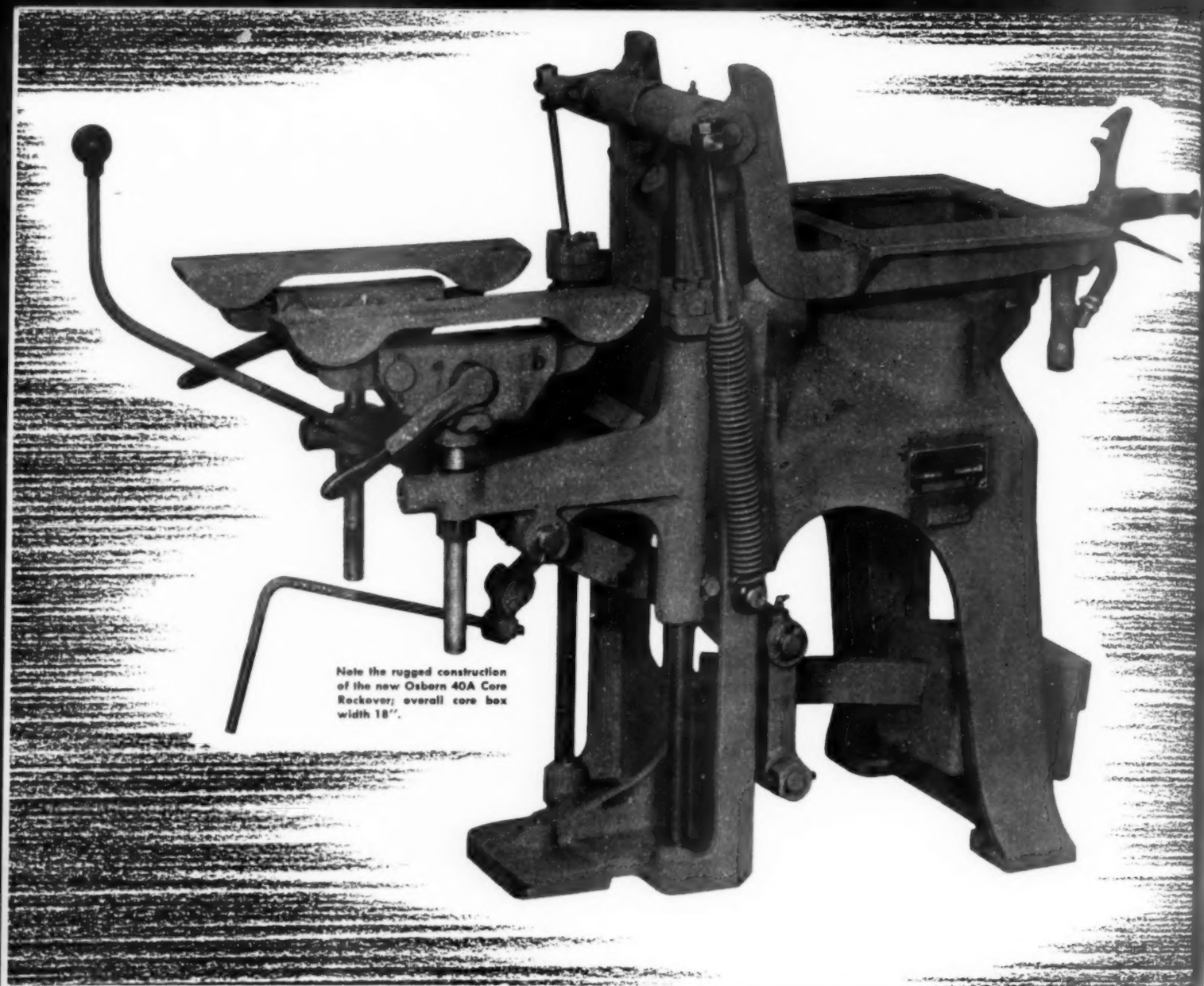
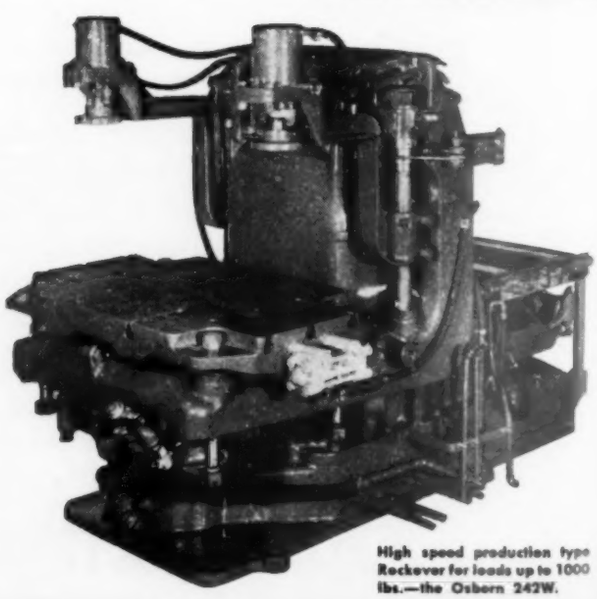


Note the rugged construction of the new Osborn 40A Core Rockover; overall core box width 18".

Portable type Rockover, highly flexible, for jobbing and semi-production work up to 1000 lbs.—the Osborn 444.



High speed production type Rockover for loads up to 1000 lbs.—the Osborn 242W.

## THE OSBORN MANUFACTURING COMPANY

5401 Hamilton Avenue Cleveland, Ohio

# Osborn Announces a *NEW* CORE ROCKOVER

Here, for the first time, is a Rockover for small work that's built like a heavy-duty machine to stand up under severe operating conditions.

Longer service life is assured by the heavier, more rugged construction.

Another feature is the simplified draw guide mechanism with widely spaced round guide bearings—providing prolonged draw accuracy. This also makes possible easy, fast restoration to original accuracy, eliminating difficult maintenance work.

The new Osborn 40A Rockover provides more efficient rockover balance of all loads within the capacity of the machine. The levelling mechanism may be used with or without levelling bars. A full 10″ draw stroke is provided at a maximum core box depth of 12″.

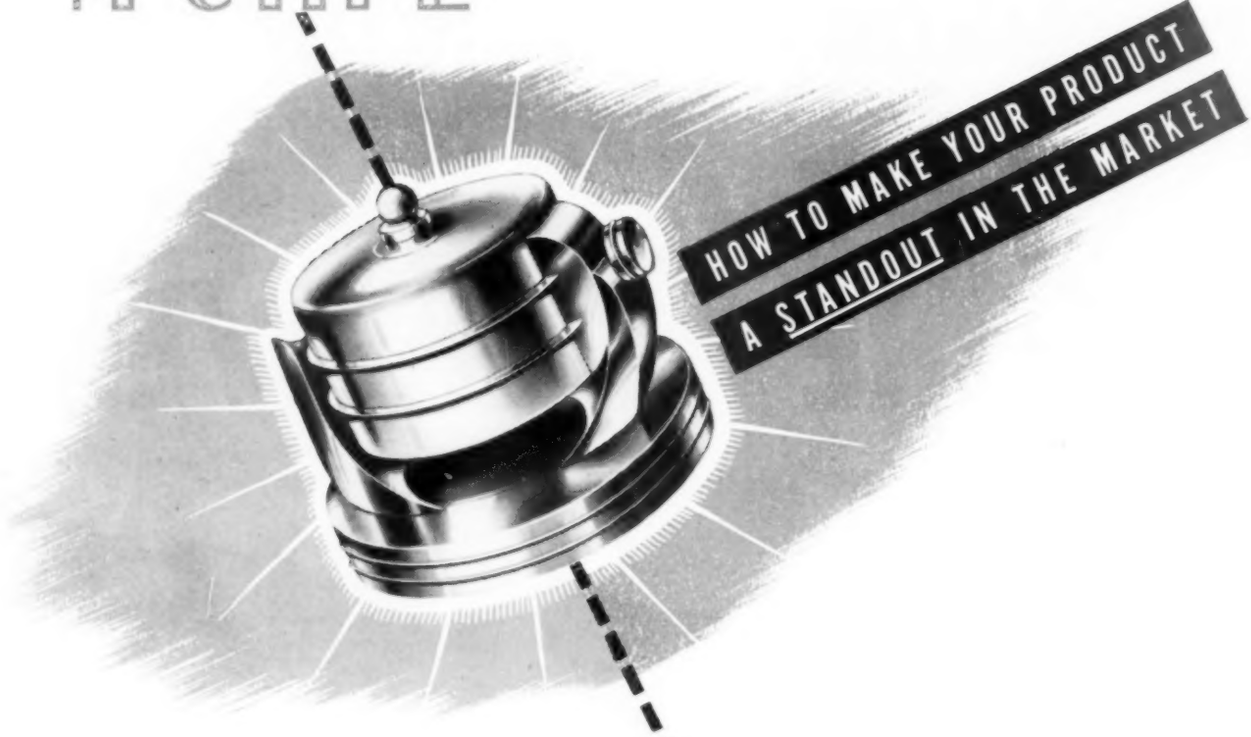
This is one (the smallest) of a complete line of Osborn Rockovers for handling loads up to 2000 lbs. in both moulding and core making operations.

OSBORN

MOULDING MACHINES

MEMBER MANUFACTURERS ASSOCIATION, INC. FOUNDRY EQUIPMENT

# ACME ALUMINUM ALLOY CASTINGS

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When you design or redesign, let Acme prepare your product for its maximum success . . . make it a "standout" in its market. An Acme engineering analysis of your problem will be made without obligation.

**13 REASONS FOR ALUMINUM!**

Aluminum . . . two-thirds lighter in weight, is also—highly corrosion resistant—easier to machine—has exceptional alloyed strength . . . is formable into intricate shapes—highly conductive for heat and electricity—highly reflective for light and radiant heat—non-toxic—non-sparking and non-magnetic—rich in appearance—easier to handle . . . costs less to transport . . . has high scrap and reconversion value.

## ACME ALUMINUM ALLOYS, INC.

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*Patterns · Tools · Aluminum, Brass, Bronze Castings · Engineering*

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# Co-operation and Confidence Gain

AS A tribute to a great industry that served its country with distinction during an unprecedented emergency, THE FOUNDRY has devoted this issue to an extensive report of wartime technological progress in castings. This study confirms the frequently expressed opinion that producers of castings have made technical gains during the past five years which will be reflected advantageously in both practice and product as production for civilian economy hits its stride.

In addition to considering engineering developments of castings, any evaluation of progress must weigh psychological aspects of progress. Have these lessons, which foundrymen most certainly learned the hard way, left foundries stronger to meet the challenge of greater problems and keener competition? Let us consider just two of the many transitions which history will record.

From the standpoint of facilities, the foundry industry expanded considerably during the war, especially in steel, aluminum and magnesium. Expansion took the form of new plants, financed chiefly with government funds, and in the modernization and expansion of existing facilities. Much government-financed foundry capacity as yet remains to be sold as surplus property.

Had the gray iron, malleable iron, and brass and bronze foundrymen been as progressive as producers of steel castings prior to the war in selling the military services and the public on the value of these types of castings, expansion of facilities for production of steel castings might not have been as large. Steel castings were specified for practically all military uses during the early days of the emergency, and it was not until the first part of 1943 that Washington "discovered" the need for large quantities of small gray iron and malleable iron castings. By that time, lack of orders and the reckless drafting of skilled workers had so depleted personnel that meeting accelerated war demands was almost an impossibility.

The resulting production crisis and attempts of government agencies to "help" foundries recruit labor long will be remembered by foundrymen. But more important, the general public was given a distorted picture of the foundry as a place to work and this may require years of effort to correct.

If the difficulties of these phases of war production have been of any value, foundrymen should have learned that the fortunes of one branch are interwoven to a marked extent with the success of all other branches. Experience should indicate that the production of castings constitutes a single industry, and success of this industry in meeting emergencies of war or needs of a nation at peace demands the co-operative effort of all branches.

The second great change stems from a new appreciation of the importance of castings to modern civilization. Out of the war and its tremendous demands came the firm conviction that castings are basic engineering materials in almost all types of production. A realization of importance at last became firmly fixed in the minds of foundrymen. At the same time the general public learned that these things called castings have a bearing on the well-being and comfort of everybody.

Knowledge of the need for co-operative effort, and confidence in the future of the industry and its products, can become just as important factors in the future progress of castings as technological developments.

Frank G. Steinebach
Editor

# PROGRESS IN CASTINGS

WHAT have been the important milestones in the progress in castings since America declared war against aggressor nations back in December, 1941? During the entire conflict and since the surrender in the Pacific last August, THE FOUNDRY has presented to the foundry industry all such information on developments as national security permitted. Much remains to be released.

With the dawn of a new year and perhaps a new era in the use of castings, the time seems opportune to review, in as complete a manner as possible, the wartime developments in American foundries. Therefore, this issue of THE FOUNDRY is devoted almost entirely to such a study of wartime progress in castings. The project has been made possible through the wholehearted co-operation of Battelle Memorial Institute and six of its foundry experts. The following pages present articles covering developments in gray iron, malleable iron, steel, brass and bronze, aluminum, and magnesium castings.

A study of these articles will show that foundry technological progress during the war was related chiefly to the further application of previously used materials and processes in order to meet new situations created by shortages of raw materials and supplies, and by tremendous war production demands. Because many basic foundry materials became critical early in the emergency, the industry found it necessary to solve problems by substituting other products which prior to that time had not been considered particularly suitable for somewhat similar peacetime applications. Rigid government specifications demanding exceptional properties resulted in the industry applying all of its "know how" to the further advancement of such factors as centrifugal and investment molding, directional solidification, x-ray and other types of nondestructive testing, heat treating practices, and facilities, equipment and practices for producing castings.

In the steel foundry field, the successful substitution of castings for forgings was an outstanding development. Large quantities of steel castings pro-

duced to very exacting specifications proved conclusively that such products can compete with forgings in meeting all service requirements. During the war steel foundrymen learned more about the use of lower-grade scrap and the conservation and substitution of alloys. Water quenching of castings played a prominent part in the production of armor and other castings for ordnance, and this development probably will continue to be an important factor in the heat treatment of steel castings. The further application of centrifugal and precision methods of casting steel was outstanding. Steel foundry capacity was enlarged tremendously.

Mechanization and greater control of operations featured wartime progress in gray iron castings. Shortages of labor led to the further use of mechanical equipment in handling materials, molding, coremaking, melting, pouring, shakeout, and cleaning operations. Although few basic changes were noted in the methods of melting gray iron, there was a trend toward application of the cupola and air furnace for duplexing in several automotive plants, an increase in the use of hot-blast cupolas, balanced-blast cupolas and various types of control equipment. To meet exacting specifications, foundrymen gave greater attention to the control of the many variables in the gray iron foundry. The inoculation process was used to a greater extent to obtain more reproducible properties in cast iron. Increased application of all of these controls will be of great value to gray iron producers in the future.

In the malleable iron industry, principal wartime developments concerned improvements in equipment and practices, and the adoption of malleable iron for many war applications where strength, toughness, and good casting and machining qualities made it a particularly desirable engineering material. Two new malleable plants built during the war provide many interesting features in design, with special emphasis on improvement of working conditions. The trend toward duplexing was accelerated. Further use of the elevator car-type, electric annealing oven, development of the portable batch-type, radiant-tube oven with atmospheric control, and further refinements in other types of annealing equipment, were wartime production aids. From the metallurgical standpoint the most interesting development in malleable iron was the addition of minute quantities of boron and tellurium for better control of annealing practice.

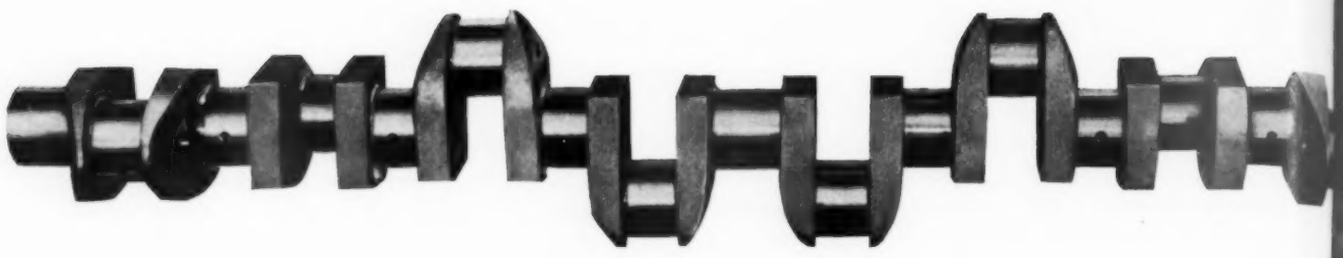
A notable metallurgical development in brass and bronze foundries was the increased use of manganese bronze. Tin bronzes were down-graded to aid in copper and tin conservation, and silicon bronzes were used more extensively. Other developments in the field included expansion of centrifugal and precision casting methods, modernization of many foundries and development of cupola melting practice for bronze.

A substantial expansion of facilities, mechanization and betterment of production techniques, and general improvement in the quality of castings, were important developments in the field of aluminum. Progress also was recorded in the further development and application of testing procedures, methods of casting, selection of alloys, and expansion in the use of permanent molds.

The greatest expansion of facilities, when measured against prewar capacity, took place in magnesium castings. Statistics indicate this expansion was in the neighborhood of 50 fold. But the most striking progress in this field was the developments in practices and the resulting improvements in quality of product. This progress resulted from exacting demands for highly complicated aircraft castings. Since a light-metal conscious public probably is expecting to secure more light alloys in the products they buy, wartime progress should aid in enlarging the market for aluminum and magnesium castings.

The editors of THE FOUNDRY believe that the reports on the following pages should be of considerable interest to foundrymen everywhere, for surely wartime progress will go far in charting the course of the foundry industry as it moves forward into civilian production.

E TEEL . . . . BRASS-BRONZE . . . . ALUMINUM . . . . MAGNESIUM



# GRAY IRON

## ACCEPTANCE BROADENS

By TOM BARLOW
*Research Foundry Engineer*
Battelle Memorial Institute
Columbus, O.

*Importance of gray cast iron as versatile and valuable material suitable for new applications is realized more fully by design engineers as a result of wartime experiences. Better operating control and research developments raise product quality. Mechanization of plants is more general*

THE gray cast iron foundry industry has seen a strange combination of feast and famine during the wartime period. The situation for any one division of the industry often has changed rapidly and frequently from 1939 up to the present time. Almost every type of gray iron foundry has seen periods of unusual overproduction with demands much greater than the supply, and also, periods of complete stagnation. This has resulted from the fact that the gray iron foundry industry is extremely diversified in nature, and also, because it is difficult to change foundry capacities from one type of casting to a distinctly different type under the conditions of short notice which war programs imposed.

For example, during the first two years of the war (the prewar period as far as the United States was concerned), there was a wave of foundry prosperity for all branches of the gray iron industry. This continued until the time of shutting down the automotive plants, refrigerator plants, washing-machine manufacturers and other producers of consumer goods, and the subsequent complete conversion to wartime products. During the conversion period, the machine tool foundries found themselves flooded with orders and could only promise delivery 12 to 18 months after receiving orders. During the same time in which this unnatural activity was observed in the machine tool industry, the light production shops were faced with the prospect of going out of business for lack of orders. Some of these foundries tried to enter the machine tool field, and some of the latter plants requested extreme expansion.

The War Production Board made a valiant fight to prevent any permanent increase in the machine tool capacity which might upset the postwar balance within the industry. Because of the intense effort and wholehearted co-operation of the machine tool foundries, the industry survived this period through increased production and by converting only those shops that had the proper equipment and the ability to make the heavy castings without the necessity for extreme alterations. As a result, the demand for machine tool castings was met, and still the industry is not faced with excessive capacity which might interfere with normal peacetime production.

Long before the machine tool program started to slow down, a sudden shortage of piston rings arose as a result of the airplane industry being the No. 1 priority of the nation. Again, there was a tremendous demand for foundries to be converted in spite of the fact that the piston ring industry is highly specialized and requires a background of years of experience; however, WPB was fortunate in being able to obtain the production required through existing facilities. In many cases, piston ring foundries leased or borrowed additional capacity and staffed it with experienced help. In other cases, the producers worked

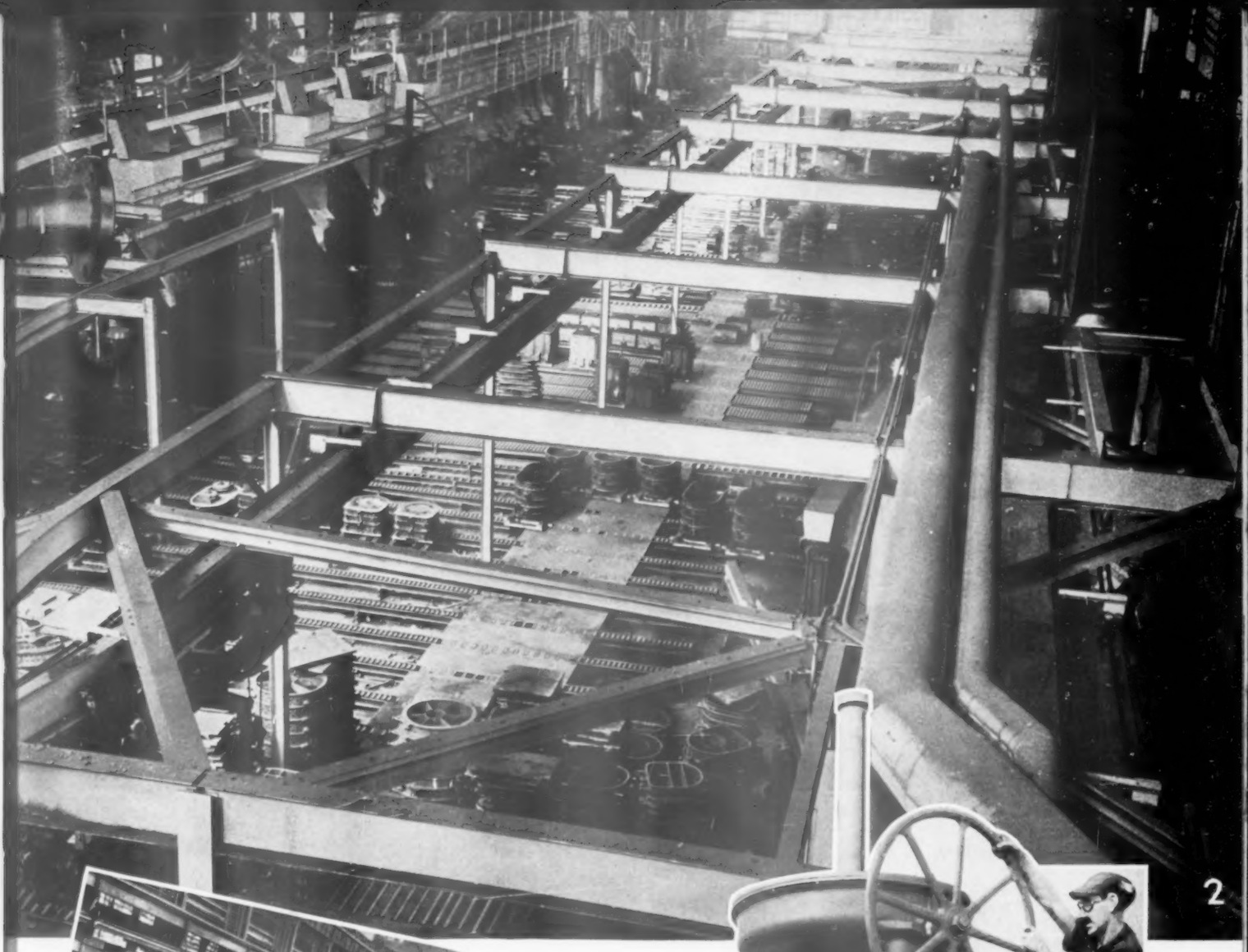
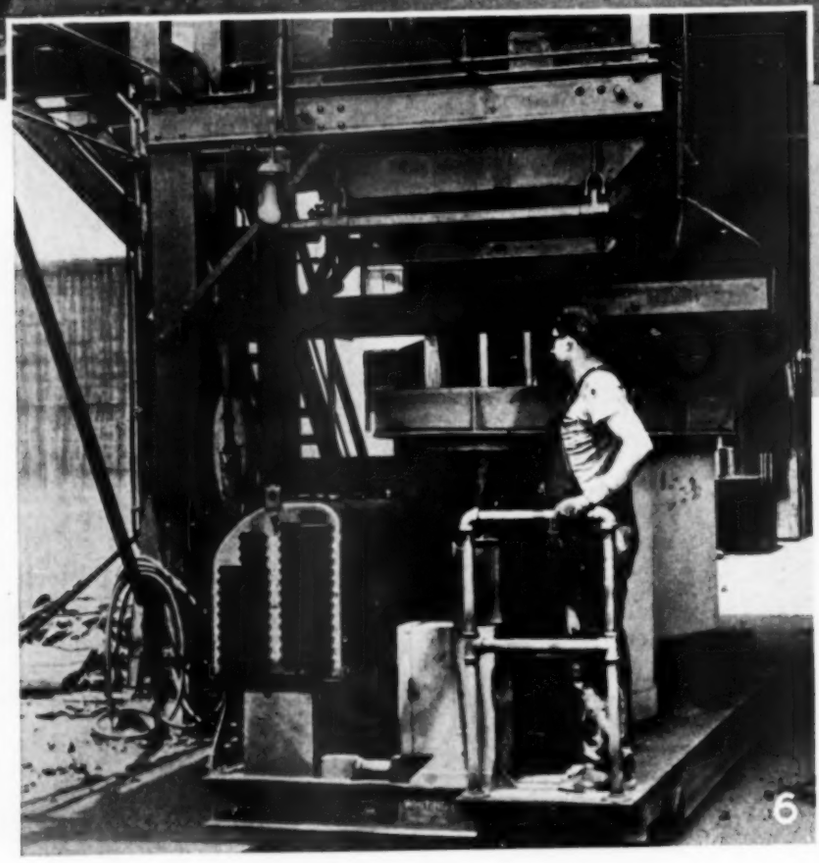


*Fig. 1 — Cast nickel-chromium-molybdenum iron crankshaft, 15 ft 1½ in. long, weighing 4700 lb. This is typical of larger crankshafts produced immediately prior to and during the war*

*Figs. 2 and 3—Views before and after mechanization of a gray iron foundry. Original bench and floor molding setup was changed to incorporate roller conveyors, handling of molten metal on monorail, and semiautomatic shakeout*

*Fig. 4—A 24-in. gray cast iron speed valve used for the Big-Inch oil pipe line*



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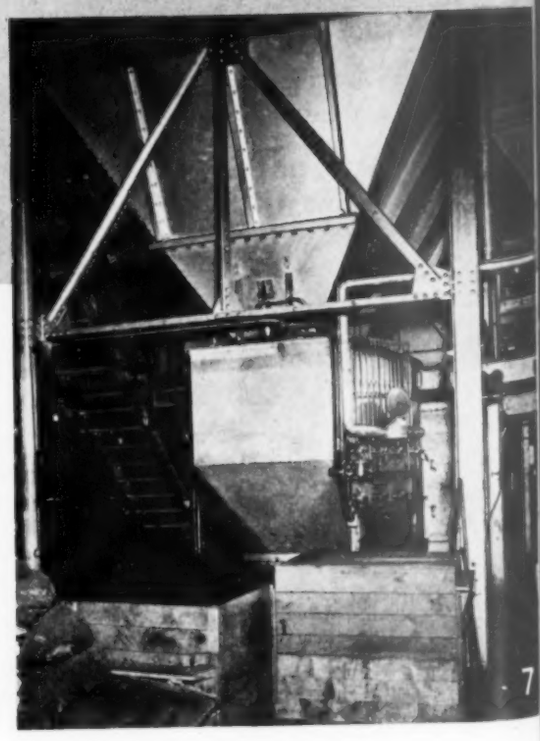

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with the few that converted and took them under their own wing to help them meet production requirements. As a result, the program was completed without upsetting the postwar balance in the piston ring industry.

During this period, a large portion of the foundry industry was on its last legs, when suddenly the war program changed. Demand for tank parts increased rapidly, also for landing barges and other mobile units requiring automotive-type production. This activity opened up the field for cylinder blocks, heads, manifolds, pumps, brake drums, etc., and almost overnight the foundry industry found itself changing from a period of famine to one in which supply could not meet the demand. This difficulty was aggravated by the fact that many foundries had converted from cast iron to aluminum or to magnesium or steel, because those metals were in demand all during the "off-days" in the gray iron industry.

In addition to an actual reduction in available gray iron capacity, the industry had not had good manpower or material priorities. Therefore, when the sudden demand came for gray iron castings, there was a lack of foundry help and engineering "know-how," as well as equipment. Officials in Washington then found they had a new bottleneck, and it was an industry which they had not previously considered to be of particular importance to the war effort. The gray iron foundry manpower situation received tremendous publicity through the government's attempt to divert labor and skilled help to that industry. These preliminary abortive attempts at getting labor into the foundry by describing it as a dirty place to work (but no worse than being in a front-line trench) eventually were clarified, after officialdom became aware of the actual situation and learned that the foundry was not short of labor because it was a poor place to work but because of the preliminary period during which the industry had been ignored.

The last two years of the war brought many changes in the gray iron business, largely from attempts to meet the unusual demands for castings under the conditions of manpower shortage and obsolete or poorly adapted equipment. As might be expected, one of the major wartime developments within this industry has been the trend toward increased mechanization.

Mechanization of the gray iron foundry industry has included every possible feature from very minor changes such as from slow, broken-down wheelbarrows to new, streamlined rubber-tired wheelbarrows—all the way to complete reconversion and automatic molding machines, automatic sandslingers, automatic shakeouts, and mechanical charging, and mechanical handling of equipment and castings. This mechanization, in many cases, started at the melting unit, with changes to mechanical charging, rapid methods of weighing and the handling of raw materials, followed by an increased melt-

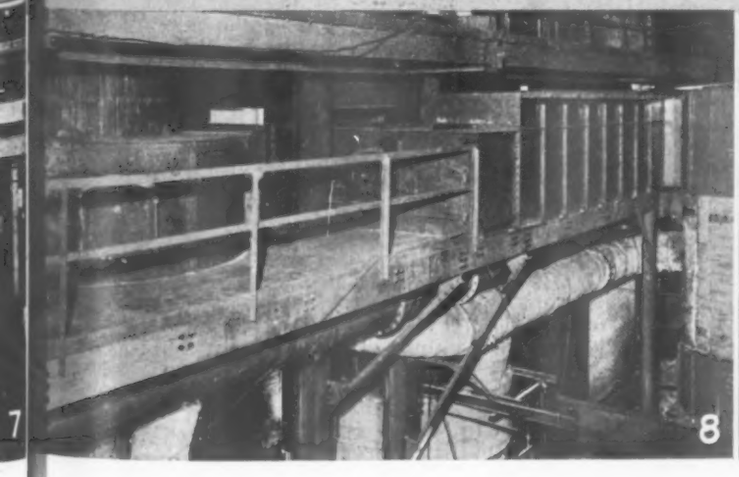
*Fig. 5—Casting floor of farm implement foundry. In the shakeout operation, sand and castings slide off inclined chute to conveyor below the floor, and bottom boards are restored to molders on return conveyor. Molds are poured off by overhead crane*

*Fig. 6—Transfer car with cone-bottom bucket in position under coke and stone bin. Proper amounts of coke and stone are weighed in special batch weigh hopper directly underneath bins while bucket is in transit*

*Fig. 7—Large sand mixer with cooling hood at farm implement foundry*

*Fig. 8—Hot blast equipment, showing circular gas duct around cupola stack and combustion chamber with supporting platform*

*Fig. 9—Coke storage bin is filled by means of electrically-operated skip hoist, shown here being loaded by special bucket mounted on engine-driven tractor crane*



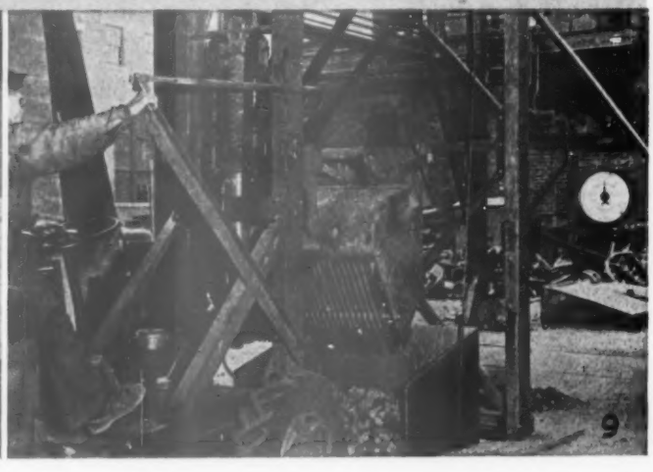


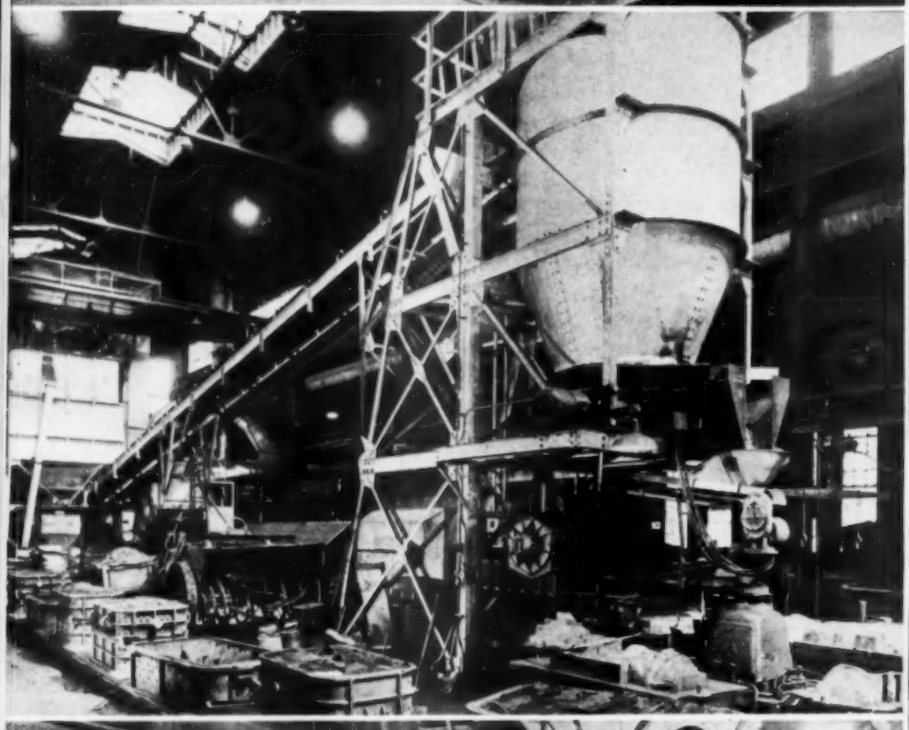
*Fig. 10—Showing method of inserting stainless steel blades in mold of nozzle ring for Elliott Co. turbo-supercharger for diesel engines*

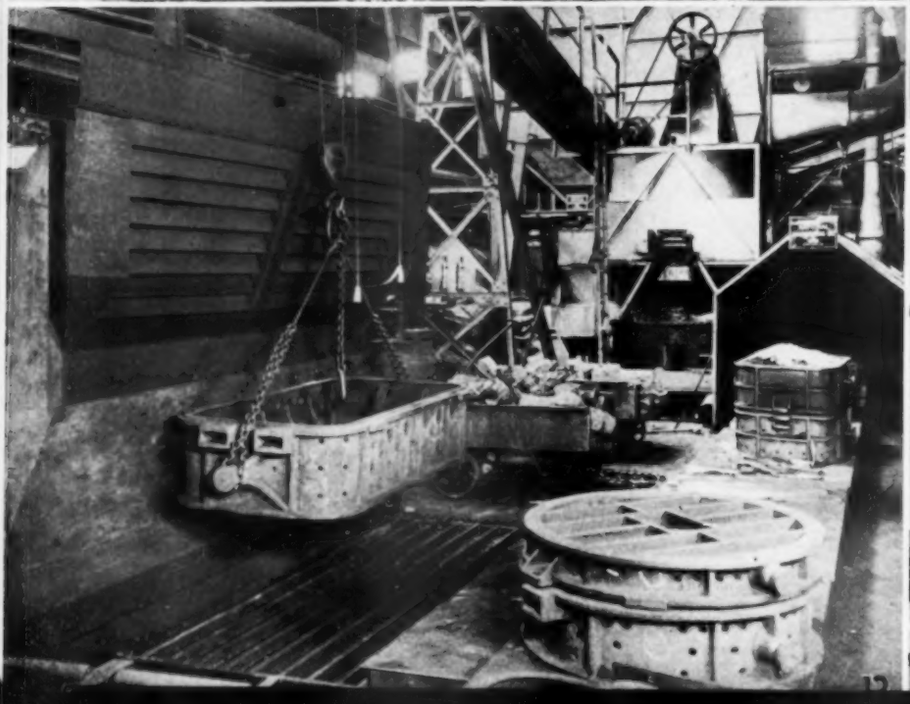
*Fig. 11—Production unit for large frames in farm implement foundry using heavy-duty continuous mold conveyor of individual cars*

*Fig. 12—Mechanical shakeout for large flasks in a production plant. Note facilities for mechanically returning flasks to sandslinger unit*

*Fig. 13—World's largest foundry shakeout, with deck area of 396 sq ft and capable of handling flasks up to 75 tons, installed at Worthington Pump & Machinery Corp.'s Buffalo works. Electrically-operated door and roof slide back to permit depositing of flasks on deck*

*Fig. 14—Another view of Worthington shakeout installation. Cleaned sand from the shakeout may be directed either by conveyor belt back to the foundry or into storage silos*





ing capacity, better control equipment, and mechanized molten-metal-handling equipment. The increased melting capacity of the foundry was kept pace with by automatic molding, conveyor lines, power shakeouts, increased cleaning facilities, overhead handling equipment, and mechanization of every conceivable portion of the installation. This progress is bound to make an important change in the postwar activity of the industry, particularly in helping the gray iron industry to meet high production, low cost competition.

Judging by the literature of the industry during the wartime period, it would seem that technical advancement or improvement of the industry has not kept pace with the mechanical or mechanization trends previously mentioned. Actually, there have been many technological advancements, many of which were developed "under cover." Unfortunately, it is yet too early to divulge many of these changes, since they are being completed and converted to postwar production. It is safe to say that the next one or two years will be marked by some very rapid and interesting technological advancements in the industry, and these will be either direct wartime developments or the result of such developments.

### Knowledge Developed Prior to the War

In spite of the necessity for military secrecy about many of the technical advances, a number of improvements in the technology of the gray iron industry have resulted from increased utilization of knowledge developed prior to the war.

One definite improvement in the technical status of the industry has been an awakening of interest on the part of the design engineer, together with a growing awareness of the extreme importance of gray cast iron and the fact that it is not a low-quality material. During the war many engineers discovered that gray cast iron is not a material but an entire family of materials which is capable of valuable engineering properties in parts ranging from 1/8-in. section (such as in a piston ring) to installations weighing 100 tons or more, cast in one piece. The irons in two such widely divergent castings are, of course, two entirely different materials, although they both carry the same generic nomenclature of "cast iron."

Engineers are also beginning to realize that they may obtain properties in gray cast iron which are not found in other materials. For example, they have found that the dampening capacity of gray iron can be utilized to speed up machining by utilizing cast iron tool holders to prevent tool vibrations with high-speed machining operations. They are learning that the name "cast iron" includes the material which meets a minimum specification of 60,000 to 65,000 lb tensile strength and provides unusually desirable properties for crankshafts weighed in pounds as well as those weighed in tons. They have discovered many new uses for this material and are also coming to realize that specifications for cast iron cannot be generalized and that the foundry should be cognizant of the use of the material, so that it can furnish the correct one of the thousands of possible combinations of elements in order to obtain the desired properties for a specific application. This wartime development may easily prove to be the most important of all in years to come.

Within the foundries themselves, there has been an increase in the knowledge of control, an increased utilization of chill tests, moisture control, melting control, sand control, scientific molding and gating, chemical analysis, physical testing, and the various control techniques which mean so much—or should mean much—to the production of a postwar engineering material under the general classification, cast iron.

Use of the "inoculation" process to obtain more reproducible properties in cast iron has become almost universal during the wartime period, and has been accepted by the industry as a standard method of operation just as the use of chemical analysis became accepted by the industry after the last war. These developments, of course, have been reflected in increased metallurgical control and metallurgical "know-how" in the industry, which, in turn, has increased the demand for metallurgical ability. Gray iron foundries are rapidly learning the wisdom of the technique which was forced upon magnesium and aluminum foundries during the war, namely, metallurgical control of all operations.

The War Production Board and the National Academy of Sciences, through the War Metallurgy Committee, have been helpful in furnishing some of the information required by the industry in order to make possible the technological advances. For example, WPB sponsored the work of C. O. Burgess and T. E. Barlow in studying "The Possibilities of Gray Cast Iron at Elevated Temperatures" to determine the limitations of the material as it is produced at the present time. This work was necessary because many of the specifications which existed prior to the war were based upon the cast iron metallurgy of 1910 and did not take into account the advances made since that time. As a result of this work, the American Society for Testing Materials and other specification-writing bodies have been given up-to-date material and information on which to base cast iron specifications. This work is bound to result in a wider application for the family of materials know as cast iron.

Few changes have been made in the basic method of producing gray iron since the prewar period, although there have been minor improvements in almost every phase of the (*Please turn to page* 162)

By C. E. SIMS
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Battelle Memorial Institute
Columbus, O.

# Steel

## PROGRESS IN CASTINGS

*Fig. 1—Tapping a 3-ton electric arc furnace into a transfer ladle at a Midwestern steel foundry. A ring type hood around the top of the furnace carries away smoke and gases*

*Fig. 2—Cast steel 10-in. mortar shells ready for shipment*

*Fig. 3—Side-blow converter in operation. Conversion of some foundries early in the war to production of steel castings usually involved acquisition of small electric furnace; use of converter to blow cupola iron, or triplex process employing, cupola, converter and electric furnace*

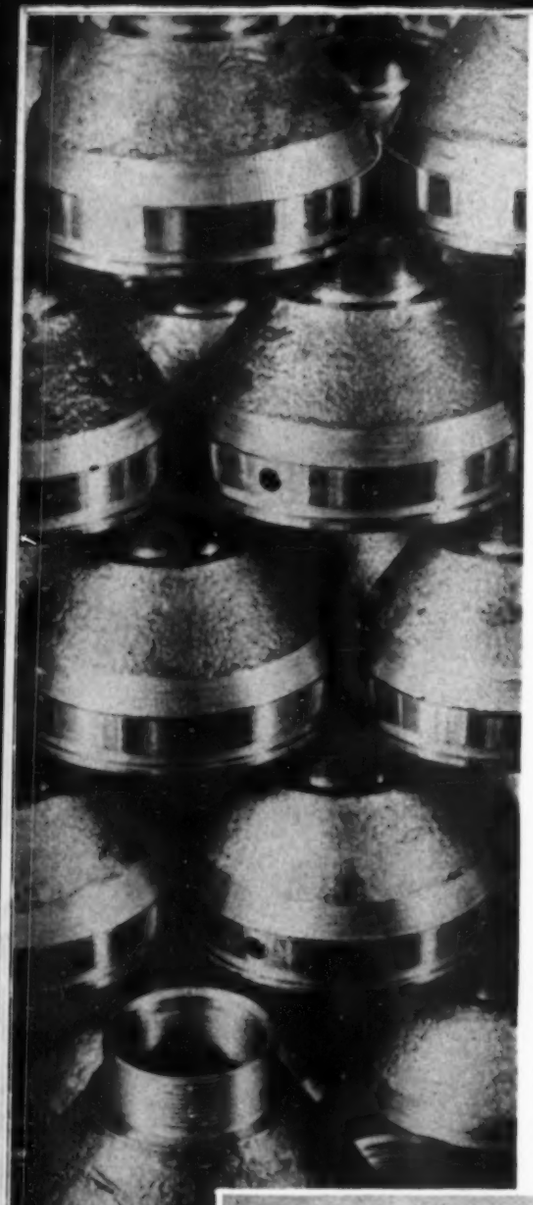
*War needs give steel castings opportunity to prove worth as products formerly made by other methods of fabrication. Water quenching comes to fore as heat treating practice*

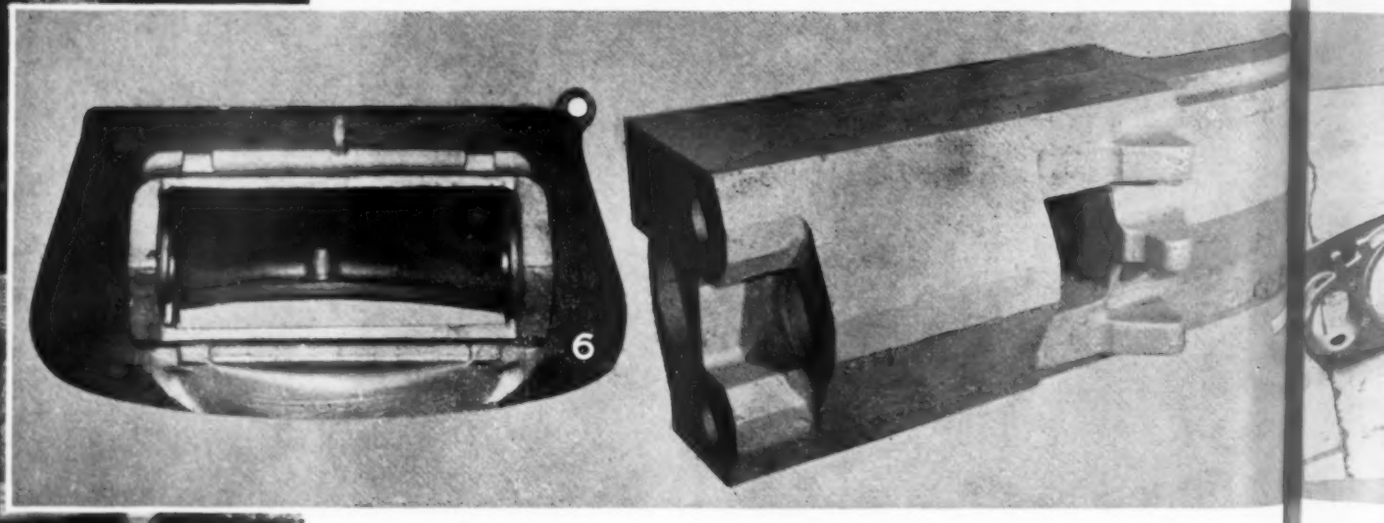
# Castings
# FIND NEW APPLICATIONS

WHEN World War II started, many steel foundries, in common with other industries, were already knee-deep in war orders. This eased to some extent the impact of war's demands, which required instant and head-long conversion to all-out production of war material. Demand was far beyond the capacity of existing plants, and a rapid expansion program through new construction was put into effect immediately. Many of the new plants were designed and constructed for specialty production of such articles as tank armor.

Curiously enough, at this early stage there seemed to be no place in the war effort for appreciable quantities of gray iron or malleable iron castings, and some plants making these products were almost forced to shut down. It should be said here that this condition was almost completely reversed in later stages. Many of these plants, with a good background of foundry techniques and know-how, but short on experience with steel castings, converted to the production of steel castings.

Such conversion was usually accomplished through the acquisition of a small electric furnace or by using a side-blow converter to blow cupola melted iron. Some used the triplex process with cupola, converter, and electric furnace. These plants had their share of troubles, as might be expected, but on the whole turned in a creditable performance. In this respect, a tribute must be paid to the established foundries who gave unstintingly from their experience to help the newcomers produce castings that would not only be usable but would be a





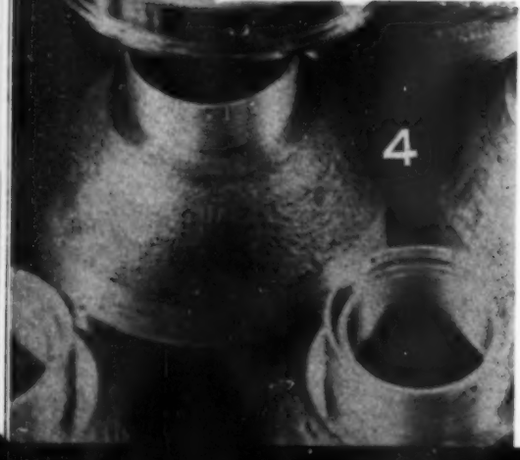




*Fig. 4—Cast steel nose parts for 90-lb fragmentation bombs after various machining operations*

*Fig. 5—Assembled wax pattern for precision casting of turbo-supercharger buckets. Precision casting or, as it sometimes is termed, the lost wax process, has found new fields of usefulness in recent years in production of parts to accurate detail which otherwise require an excessive amount of machine or hand work to bring them to the desired contour, also in making parts of high melting point alloys*

credit to the entire steel foundry industry as well.

A policy of liberal and free interchange of information on techniques, processes, and products was quickly built up in the industry, which policy was instrumental in speeding production and in raising the quality level of the output. Because of wartime restrictions, this interchange was necessarily limited to those properly entitled to it.

Necessity to utilize all available capacity worked to dispel some prejudices and misconceptions. Converter steel, for example, had been blacklisted in certain specifications and in widespread popular opinion. Because of the new situation and aided by new information, the ban on converter steels was largely removed. There was also a firm belief in certain quarters that cast armor plate of good quality could not be made in basic open-hearth furnaces. That misconception was quickly dispelled.

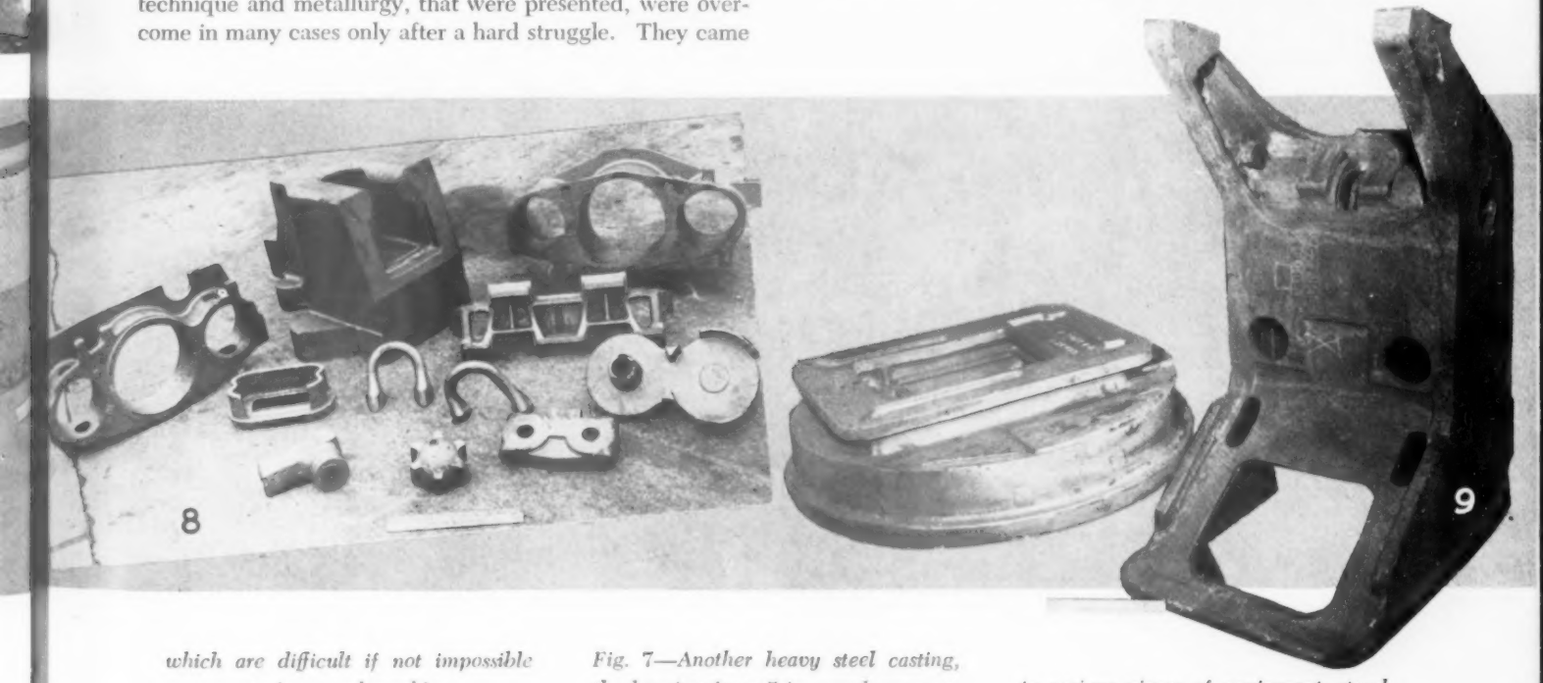
As great as was the need for the fullest possible production of castings, the shortage in forging capacity was even greater. This latter was caused by a shortage not only in forging machines but also in diemakers and alloy steel for die blocks. This extremity was the foundries' opportunity, however, for it forced the Army and Navy and even the Air Forces to consider the use of steel castings in locations where only forgings or parts machined from solid stock had been used before. For many of these parts no thought would have been given to replacement with castings had there been adequate forging capacity. Castings simply were not regarded to be as trustworthy as forgings.

It cannot be said that castings were able to step into the breach and fill all requirements immediately. These were new and untried products with stringent requirements and exacting specifications. The new problems in foundry technique and metallurgy, that were presented, were overcome in many cases only after a hard struggle. They came at a time, too, when labor turnover was high, and much of the skilled help was leaving for more glamorous and higher paid war jobs or were being drafted for military service. During this period, the supervisory and technical staffs, who would normally spend most of their time on development work, were required by conditions to devote most of their energy to personnel problems. The difficulties of these developments are exemplified by the significant statement of one foundryman who remarked of a new product, "We have it whipped now, but had we known how tough it would be, we would not have tackled it."

Nevertheless, the breach was filled, and many thousands of sound and serviceable castings were produced to very exacting specifications. In service they proved conclusively that well-made castings can compete with forgings as far as all service requirements are concerned. This is a distinct step forward for the casting industry, because previous to the war, such a statement would have met widespread skepticism or open disbelief.

Steelmaking methods in general were not changed much by the war. There was, of course, the usual accommodations for the use of lower grade scrap and for conservation of alloys. However, a great effort was made to standardize melting practices along the best basic principles. Among those principles which appeared to be essential to good practice were thorough oxidation accompanied by a vigorous boil during the refining period and thorough deoxidation as late as possible in the heat.

Compositions of cast steel were not altered to any material extent during the war. By this it is meant that no new compositions were introduced, although there was a pronounced swing to a higher proportion of alloy and high-



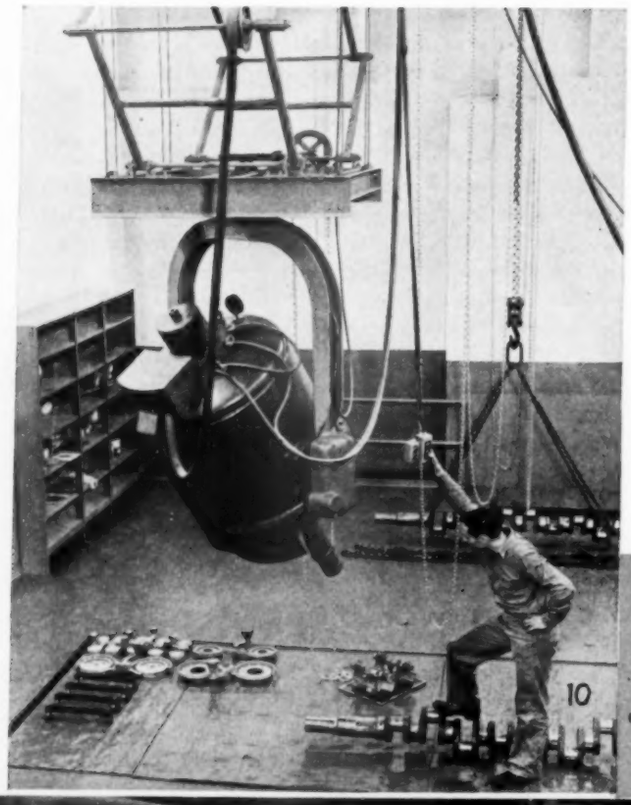

*which are difficult if not impossible to forge and machine*

*Fig. 6—Typical of the large sizes of steel castings required for war materiel is this tank part. Heat treatment of such castings resulted in development of a new technique*

*Fig. 7—Another heavy steel casting, the housing for a 5-in. naval gun partially rough machined*

*Fig. 8—Various steel castings used on the M-36 tank, including gun cradle bracket, breech ring for 90 mm gun, tank tread, hoisting eyes attached to various pieces of equipment, stand bracket, hub cap, arm support and spring seat casting*

*Fig. 9—Steel castings comprising the base and carriage for the 40 mm Bofor gun*




strength steels. The NE steels, for example, were used very little. Except for stainless steel castings, nickel was banned, and vanadium, which at first was not allowed, was later used in certain alloy steels.

Although the same campaign was waged to conserve alloys by cutting alloy contents to the barest necessities, the emergency steels were not forced on the casting industry to the same extent as in the wrought steel field. There were several reasons for this. Casting production was relatively small in tonnage but, more important, nearly all the castings were made for special purposes which would allow no compromise in properties and for which the War Production Board allocated sufficient material. In addition to this, the foundry has a scrap cycle which is more nearly closed. Scrap is kept segregated, and the charge for each heat contains a large proportion of foundry returns. In this way, alloys are conserved, and serious scrap

*Fig. 10—Million volt x-ray machine. Wartime requirements were a leading factor in broadening x-ray use*

*Fig. 11—Cast steel breech ring being mounted on centrifugally-cast gun barrel*

*Fig. 12—Stack molded centrifugal castings in which molds are stacked vertically as well as nested symmetrically around a central vertical gate*

contamination is prevented by comparatively simple means.

**Foundry Techniques**—While it is probably true that no entirely new techniques were developed, there was a decided stimulus to concentrate on the newest and best method known. The principles of directional solidification were just beginning to be widely understood when the war started, and the use of atmospheric pressure to feed castings was given a big impetus. The latter was used particularly in the blind riser, and numerous devices, such as special pencil cores, wafer cores, and graphite rods, were used to produce openings in the shell of the blind risers to admit air pressure. This one development is credited with making possible the production of many sound castings that might not otherwise have been made at all.

Better patterns were used than ever before and with more streamlining and special pads to serve as dirt catchers, which were later removed. (*Please turn to page* 220)

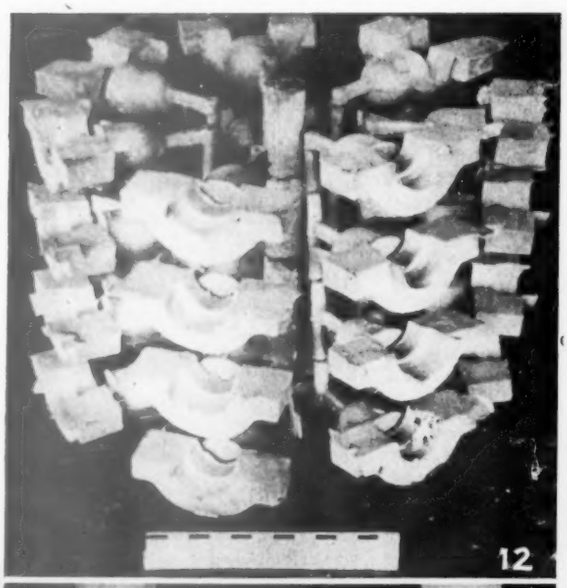
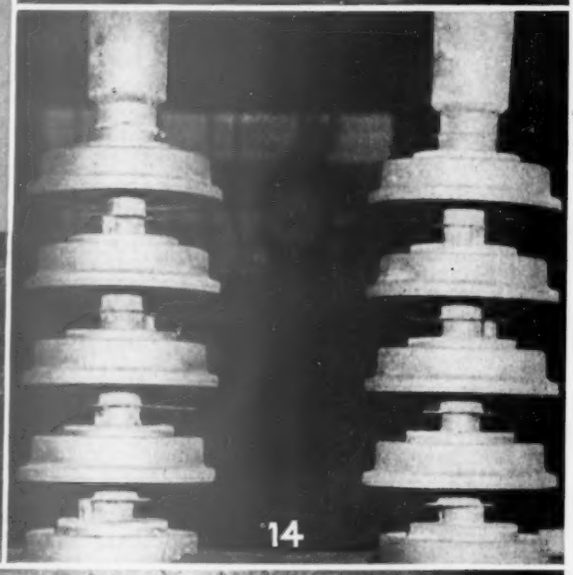
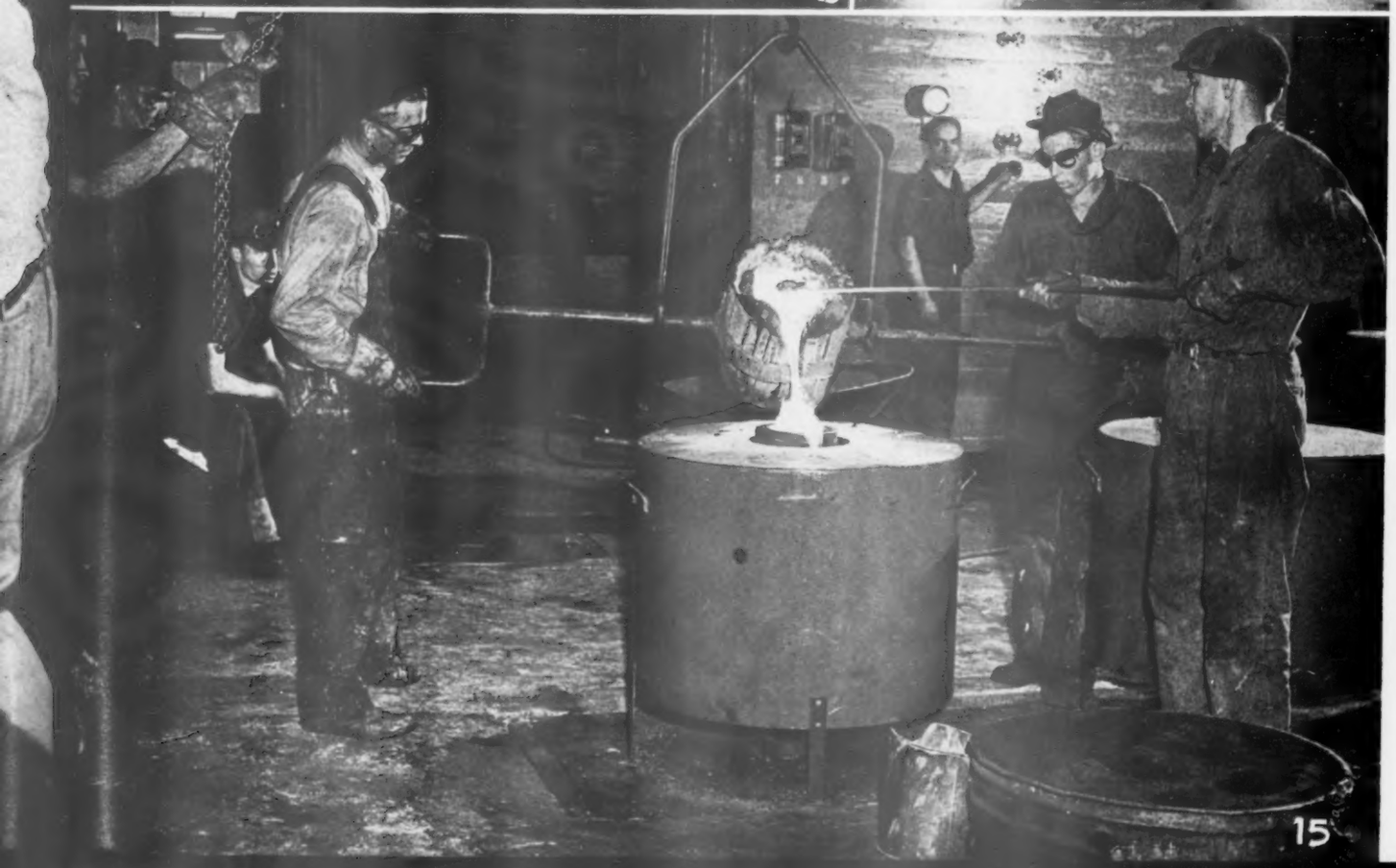


*Fig. 13—Magnetic powder indication of hot tear on rough surface of casting. Another form of inspection practice employed extensively during the war*

*Fig. 14—Another group of centrifugal castings stack molded. In this case the central down-gate extends through the hubs*

*Fig. 15—Pouring a mold in a centrifugal casting machine*





# ALUMINUM FOUNDRIES RAISE CASTING

By L. W. EASTWOOD
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OUTSTANDING wartime developments in the aluminum foundry industry consist of, first tremendous vertical expansion resulting in increased total capacity and productivity and, second, horizontal expansion whereby the highly specialized technique to produce the highest quality aluminum castings has been extended to a great many smaller foundries. Within these two outstanding developments, there has been marked progress in foundry mechanization, foundry technology, and foundry inspection procedures. These improvements in mechanization, technology and inspection do not represent sensational new discoveries. On the contrary, most of the improvements were developed by the application of knowledge and techniques existing prior to the war.

The most remarkable wartime development was the vertical expansion, or greatly increased capacity and productivity, in the aluminum casting industry. This marked increase is well illustrated by the data in Table I which show the rated capacity of aluminum casting plants in 1944. Table II shows actual 1944 aluminum casting production in these plants. It will be noted that all permanent mold castings and all die castings in 1944 were produced in privately-owned plants. Furthermore, 92 per cent of general sand castings were produced in privately owned plants.

### Specialized Foundries Not Readily Converted

Most government funds which went into the aluminum foundry industry were for the production of air-cooled cylinder head castings. These castings require a specialized technique and are produced in all dry sand molds or cores. Since few foundries were experienced in or equipped for that type of production, it is logical that government-owned plants were built to produce cast cylinder heads for the tremendous air-cooled, engine building program. These special foundries were separate from general sand-casting foundries, and because of their specialized equipment are not readily converted to a general type of sand foundry.

General aluminum sand-casting foundries, permanent mold plants, except one, and die-casting shops all are privately owned. Total capacity of the privately owned aluminum casting industry is approximately 640,000,000 lb in which approximately 430,500,000 lb of castings of all kinds were produced in 1944. While precise data are not available for the year 1939, the privately-owned casting capacity is approximately 7 to 8 times greater than the total 1939 production. Thus, the first outstanding wartime development in the general aluminum casting industry was the expansion of the total capacity to 7 to 8 times its prewar production.

While this vertical expansion of the aluminum casting industry, may produce some instability and insecurity in the future, the horizontal expansion will help greatly to

*Fig.* 1—*Inspecting aluminum piston shortly after its removal from mold. The part was cast in a permanent mold*

*Fig.* 2—*Removing gates and risers from a large aluminum ring casting by means of a band saw*

*Specialized technique for producing highest quality aluminum castings is extended to many smaller foundries. Wartime demands expand industry's capacity seven to eight times that of prewar production. Plant mechanization, improved inspection methods, and some trends in selection of alloys are other important aluminum foundry developments of recent years*

# PROGRESS IN CASTINGS

# ...G QUALITY

place the entire industry on a sound and stable foundation. Prior to the industrial preparations for war, only a few foundries were considered capable of producing aircraft-quality castings. Many foundries, inexperienced in the high-quality field, faced the problem of producing such castings with confidence but not with overconfidenece. By their intelligent efforts, the exacting standards of inspection for aircraft-quality castings were met successfully and the general quality of the castings produced by the industry was improved.

The result was greater confidence on the part of the user, and wider use of these high-quality castings in applications which might normally have been made as forgings. This healthy state of affairs was obviously a tremendous boon to the war effort. Thus, the second major wartime development concerns the demonstration on the part of many foundries that they were capable of producing castings of higher quality than the best prewar standards. Unlike the first major development, this one can be carried into the postwar era with a markedly beneficial effect upon the aluminum-casting industry.

Main technical developments consist of foundry mechanization, improvements in general foundry techniques leading to generally improved quality, better understanding of the problem of inspection, some new developments in inspection methods, new developments in casting methods, and some trends in the selection of various alloys.

Prior to the war, aluminum foundries were not forced into high-production methods. In general, good engineering and foundry layout were woefully lacking in most plants. It is not surprising that the automotive industry, converting to war production, led the way and spread the gospel of mechanization, involving good foundry layout and engineering. Furthermore, the necessities of heavy production and labor shortage have been a considerable incentive to mechanization of foundries in both England and the United States. In some quarters, mechanization has been effected to lighten the work and improve working conditions commensurate with the use of a high proportion of female labor. The British have been particularly active in mechanizing their general sand foundries. On the other hand, the best examples of mechanization in the U. S. A. have been largely confined to the Defense Plant Corp. cylinder head plants. However, improvement in and modernization of the equipment which has been made in the general sand foundries during the war period should improve their position in postwar industry.

By far the most important metallurgical development already has been referred to, namely, the general improvement in the quality of the castings produced. This has come about by the determined efforts of the foundry personnel to understand and apply good, sound foundry prin-

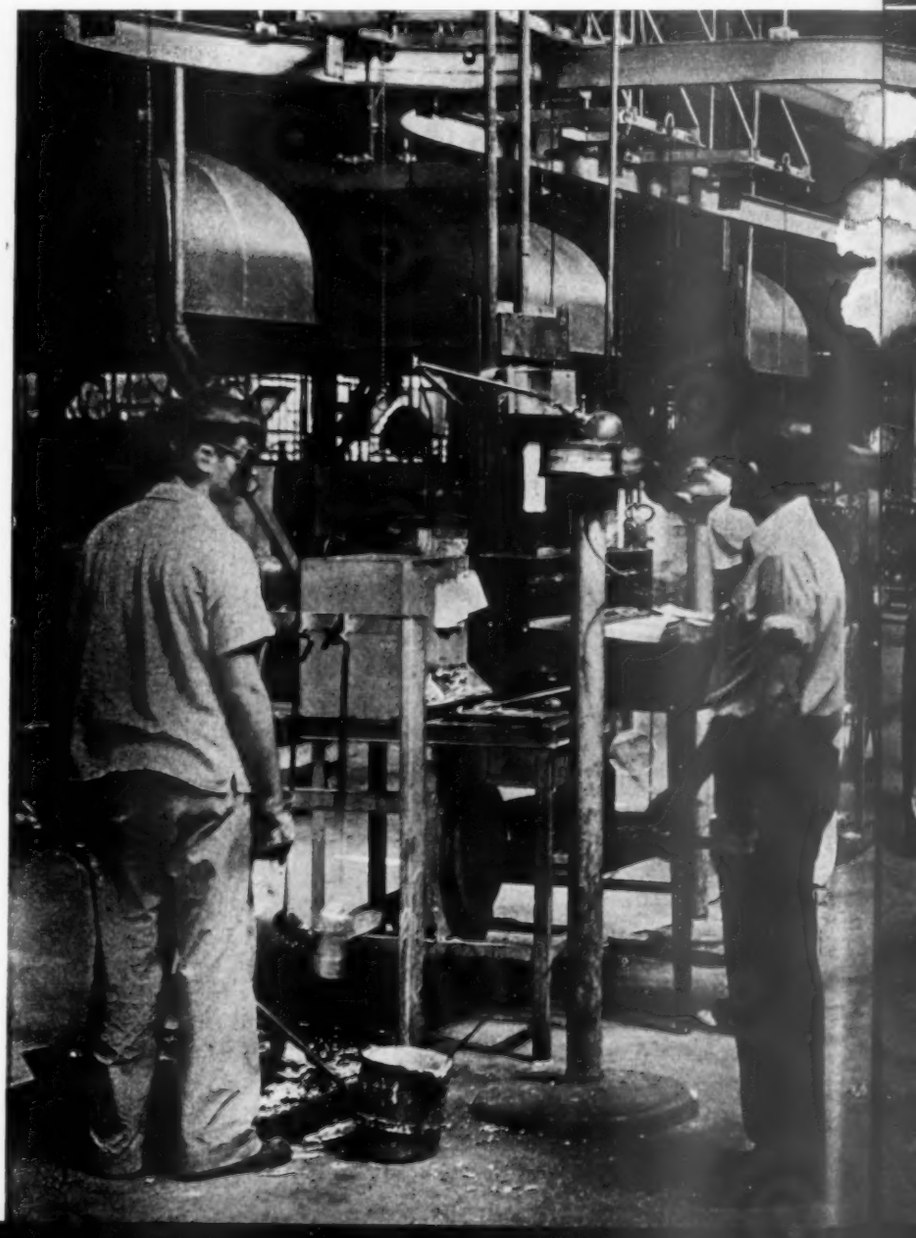

*Fig. 3—Using a jig in checking dimensions of cast aluminum cylinder head for Allison aircraft engine*

*Fig. 4—Localized pouring station permits good supervision and control. Furnace hoods remove heat and fumes during melting, and hood over conveyor fumes from molds after they are poured*

*Fig. 5—Indicative of mechanization in aluminum foundries are the mold conveyor, sand-handling system and molding machines shown here*

*Fig. 6—Handling cores by conveyor from machines to oven*

*Fig. 7—Cores are assembled and transported on belt conveyor*

*Fig. 8—Assembly line for production of plaster molds. Increased use of plaster molds in production of aluminum castings has been an important development in the industry*

*Fig. 9—Heat treating department of aluminum foundry showing operator removing load from quench tank*

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ciples to the production of their castings. This is an outstanding example of important progress which has been made by the application of existing knowledge in a highly effective and intelligent manner. Incidentally, this is a very promising field of development in the future of the entire light alloy industry.

General improvement in quality has been accomplished by the careful and studied application of good foundry practices. Degassing operations are invariably employed, and in this connection an old recommendation, the use of boron trichloride, $BCl_3$ to degas and effect grain refinement, has been revived.

Wartime developments in alloys consist of the greater use of high-purity, aluminum-copper alloys in England, the wider use of the high-purity aluminum plus 10 per cent Mg alloy, the introduction of the aluminum-zinc-magnesium casting alloys, and the very wide use of aluminum-silicon-magnesium alloys for general purpose high-quality castings.

High-purity 4 per cent Cu alloys are characterized by extreme hot shortness and susceptibility to microporosity, but these adverse foundry characteristics are offset by good properties in the heat-treated condition, provided sound castings can be made. These alloys are used somewhat in England, the higher iron and silicon version being used in the U. S.

Excellent characteristics of the high-purity aluminum, 10 per cent Mg alloy are now well recognized in this country as well as in England. This casting alloy, which must be heat treated, is characterized by excellent mechanical properties, high resistance to corrosion, and excellent machining characteristics. While the foundry characteristics make this alloy difficult to handle (*Please turn to page* 165)

## TABLE I—Rated Capacity of Aluminum Casting Plants, 1944

| Product | Government Owned Lb (thousands) | % of Total | Privately Owned Lb (thousands) | % of Total | Total, Lb (thousands) |
|---|---|---|---|---|---|
| Sand castings, general | 23,400 | 8.2 | 260,900 | 91.8 | 284,300 |
| Sand castings, cylinder heads | 200,000 | 73.5 | 72,200 | 26.5 | 272,200 |
| Permanent mold castings | 9,000 | 75.3 | 161,300 | 94.7 | 170,300 |
| Die castings | 0 | 0.0 | 145,500 | 100.0 | 145,500 |
| Total | 232,000 | 26.6 | 639,900 | 73.4 | 872,300 |
| New aluminum ingot | 1,193,000 | 53.2 | 1,048,056 | 46.8 | 2,241,556 |

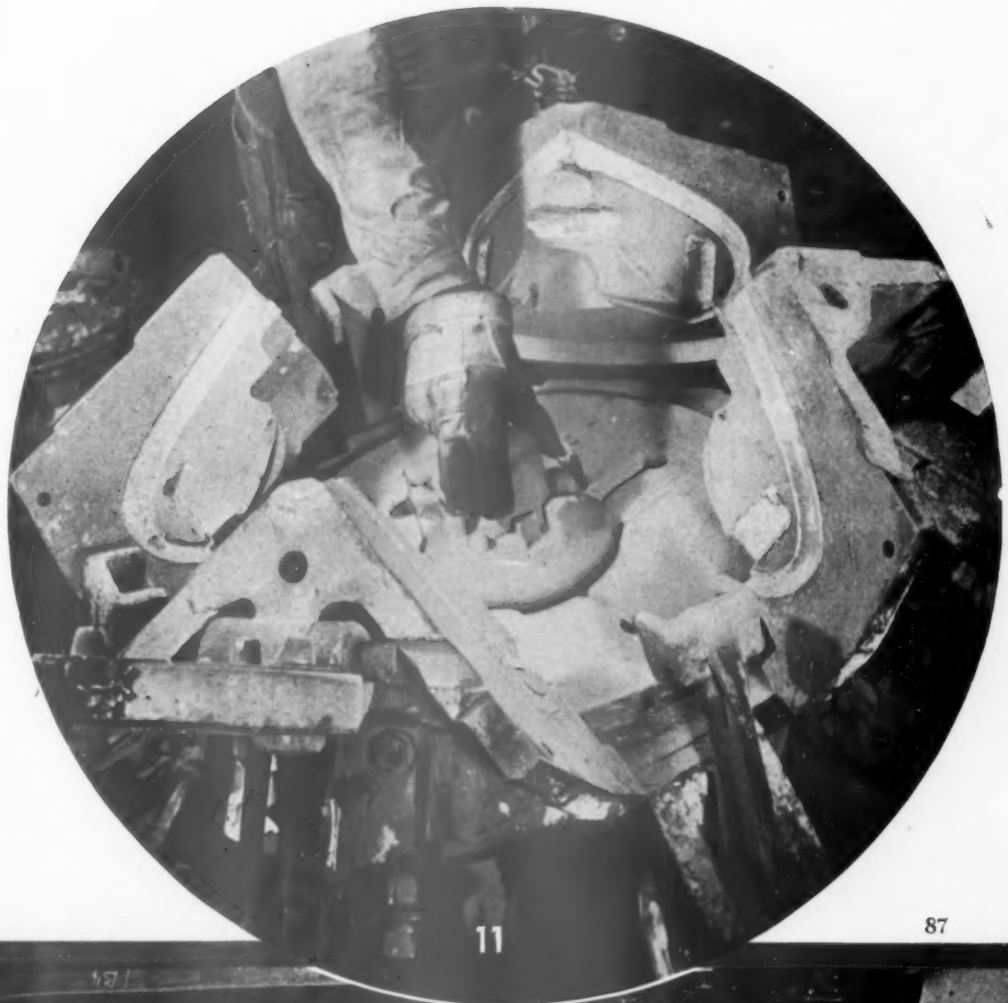
## TABLE II—Aluminum Casting Production, 1944

| Product | Government Owned Lb (thousands) | % of Total | Privately Owned Lb (thousands) | % of Total | Total, Lb (thousands) |
|---|---|---|---|---|---|
| Sand castings, general | 17,800 | 8.0 | 206,500 | 92.0 | 224,300 |
| Sand castings, cylinder heads | 91,900 | 73.3 | 33,400 | 26.7 | 125,300 |
| Permanent mold castings | 0 | 0.0 | 106,300 | 100.0 | 106,300 |
| Die castings | 0 | 0.0 | 84,300 | 100.0 | 84,300 |
| Total | 109,700 | 20.3 | 430,500 | 79.7 | 540,200 |
| New aluminum ingot | 701,714 | 45.2 | 850,982 | 54.8 | 1,552,696 |

*Fig.* 10—*View in aluminum cylinder head foundry showing final sand blast, touching up machine-locating points, brinelling for hardness test, and packing department*

*Fig.* 11—*Placing core preparatory to closing metal mold for production of permanent mold aluminum castings*

*Fig.* 12—*Transporting molds by conveyor to pouring station of aluminum foundry making finned cylinder head castings for aircraft engines*



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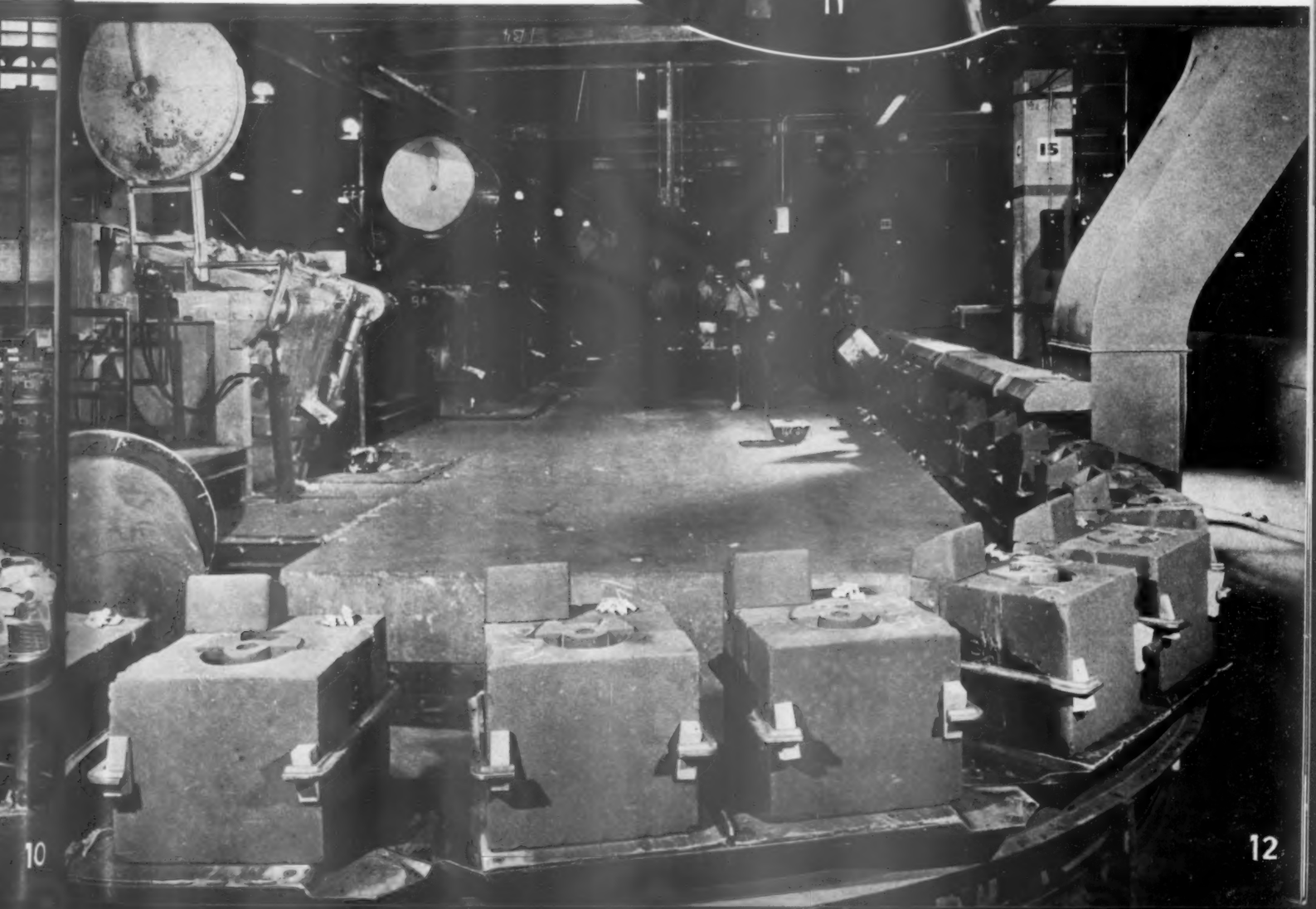

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*While the tremendous expansion in capacity for producing magnesium castings was the most obvious wartime development for the industry, its progress in perfecting the technique for casting this metal has important implications for the postwar period*

# Magnesium

By J. C. DeHAVEN
*Research Engineer*
*Battelle Memorial Institute*
*Columbus, O.*

*Fig. 1—Gaging the setting of cores to be used in a mold for making a large magnesium sand casting*

*Fig. 2—Magnesium casting as removed from the mold, illustrating size of gates and risers required*

*Fig. 3—Pouring 84-lb magnesium nose piece for aircraft engine*

# Casting Capacity Expands Sharply

MOST obvious and truly remarkable change in the magnesium foundry industry during the war period has been the tremendous expansion in production capacity. In 1939, the production in this country of sand, permanent mold, and die castings totaled 1.8 million lb. This figure was a very satisfactory increase over the production in 1935 of 375,000 lb. However, estimated production in 1944 was 86 million lb of castings, of which sand castings represented approximately 90 per cent, permanent mold castings 7 per cent, and die castings 3 per cent of the total. These figures do not include the millions of incendiary bomb bodies which were cast from magnesium during the war.

This 50-fold increase represents a huge investment in dollars, and in effort for planning, engineering, construction and operation of more than 60 large foundries which were newly built or converted to magnesium casting production. Success of the foundry industry in rapidly learning and putting into practice the unfamiliar techniques of melting, casting and heat treating magnesium alloys is attested by the thousands of aircraft built in this country, every one of which contains a number of magnesium castings in engines and air-frames. This quantity of production serves as a tribute to the intelligence and skill of the American foundryman.

A great measure of this accomplishment may be laid to the fine spirit of cooperation among the various foundries engaged in casting magnesium. Especially noteworthy in this respect has been the unselfish giving of information, advice and training to those new in the field by the few prewar producers of magnesium castings. Without this dissemination of magnesium "know-how" by those few companies, the rapid increase in production would not have been possible.

A more subtle, but probably more outstanding, development of the wartime magnesium casting production is evident in the quality of the castings made. A general characteristic of aircraft castings is their complexity. To eliminate every extra ounce of weight, many units are combined into one casting. This does away with the necessity of having flanges and bolts for assembling the separate parts, and thus reduces weight. One engine casting, for example, may contain sumps, housings, volutes, brackets, and bosses for mounting and containing oil and coolant pumps, distributor, magnetos, carburetor and various auxiliary gear trains.

Sections are thin—5/32-in. is not unusual—and finish for machining is kept to a minimum. Often these castings must be made to a tolerance of 1/32-in. or less in sand. Certain castings require 50 or more cores to be assembled before setting in the

mold. Of course, very careful jigging is necessary during assembly and setting as indicated in Fig. 1, and to add to the difficulty, myriads of shaped metal chills must be placed in the cores and in the mold to assist in the promotion of directional solidification. A medium-size foundry may have over a million of these chills of various sizes and shapes which must be sorted, stored, maintained, routed to the proper position in the coreroom or molding floor, and recovered from the sand at the shakeout.

Beside the strict dimensional specifications applied to magnesium aircraft castings, the metal in the castings must meet quality standards which define the required mechanical properties, pressure tightness, and freedom from inclusions and small defects. The failure of any of a number of magnesium castings in an aircraft in flight might easily result in catastrophe for pilot and crew. Maintenance of metal quality standards has required that every step of melting, pouring and heat treating of castings be kept under rigid control. For this purpose, magnesium foundries are completely supplied with automatic indicating-recording pyrometers, chemical and metallographic laboratories, radiographic and mechanical testing equipment and, more important than these, with a competent foundry metallurgist.

The metallurgist has assumed a much more important role in the magnesium foundry during the war than in most foundries previously, with the result that a degree of control and consistency of casting quality has been obtained which would not otherwise have been possible. The metallurgist has worked with the foundry and pattern superintendents in developing new castings, and usually has had the final word as to when the casting is ready to be released for production. Technical liaison with users of the castings is maintained through the metallurgical department, and all processes from melting through heat treating and inspection are subject to the control of the metallurgist. It is to be hoped that the beneficial results which have accrued through this system will not be retarded with peace, but be continued in magnesium foundries and applied to a greater extent in other foundries to the general profit of the industry.

Improvements in melting techniques for magnesium alloys have been developed recently which permit a closer control of metal quality than was previously possible. It is safe to say that it is now feasible to melt magnesium as easily, or probably more easily, than any other engineering metal, and to obtain consistently uniform properties with each melt.

Gaseous chlorine has been found to be a very effective flux for the metal, giving a very clean melt and one that is free from the effects of hydrogen introduced into the metal from a solid flux, the atmoshere, the metal charge, or the stirring tools and crucibles. In addition, chlorine fluxing eliminates the need for hand or mechanical stirring of the melt as was required with the former melting practice, thus eliminating hot, dirty work at the furnaces.

In the past, it was always necessary to superheat magnesium sand casting alloys to obtain the proper grain refinement. This process involved raising the temperature of the melt 150 to 250 F above the pouring temperature, holding for a period of time (usually 15 minutes) and cooling rapidly to the pouring temperature. Close control of the temperature and time cycle was needed to ensure the proper grain refinement with this process, and besides, the quantity of metal treated in this manner is limited by the speed of cooling and safety considerations. Furthermore, iron is picked up by the melt from the steel crucibles much more readily (*Please turn to page* 206)

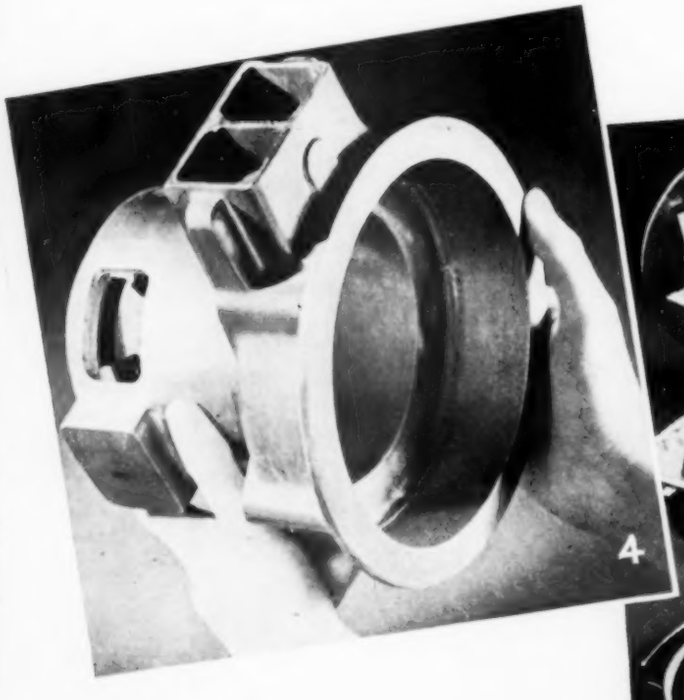
*Fig. 4—Magnesium permanent mold casting for an aircraft generator or motor housing*

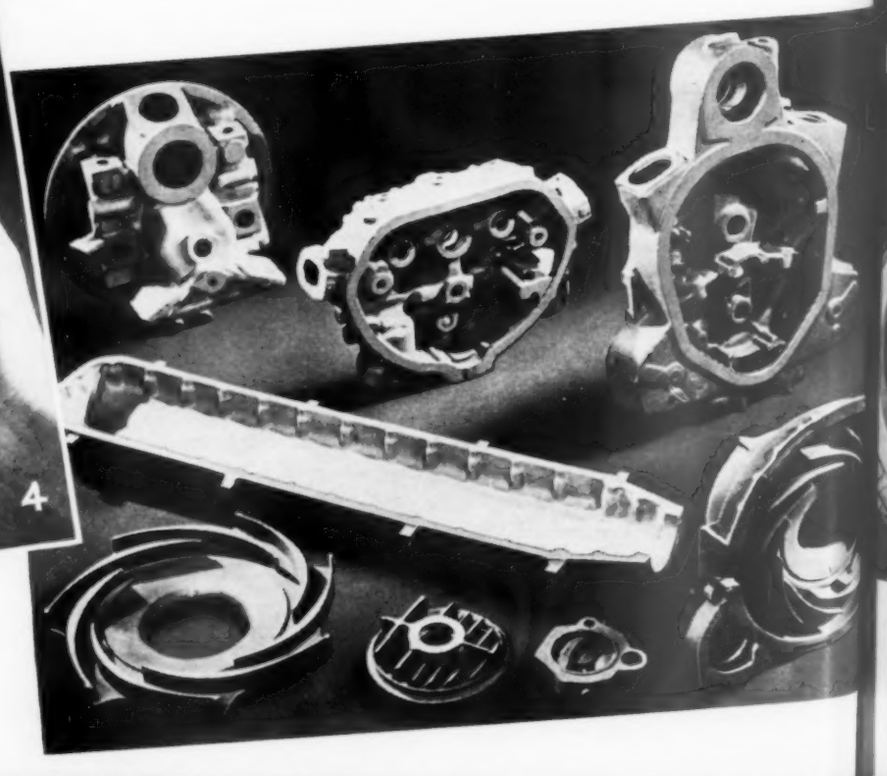
*Fig. 5—Miscellaneous magnesium sand castings used in production of aircraft*

*Fig. 6—Water-testing a magnesium permanent mold casting*

*Fig. 7—Large blower volute for an aircraft engine, made as a magnesium-alloy sand casting*

*Fig. 8—Representative group of magnesium die castings*



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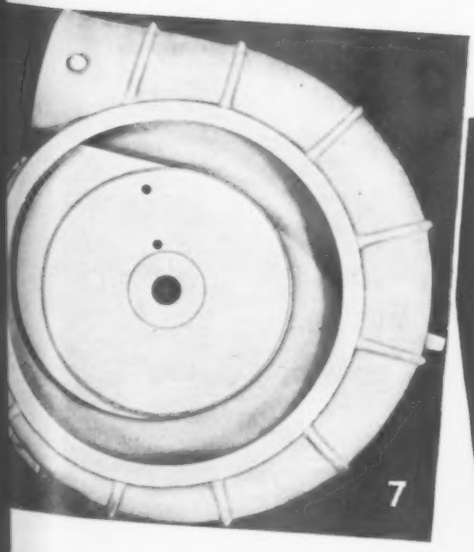

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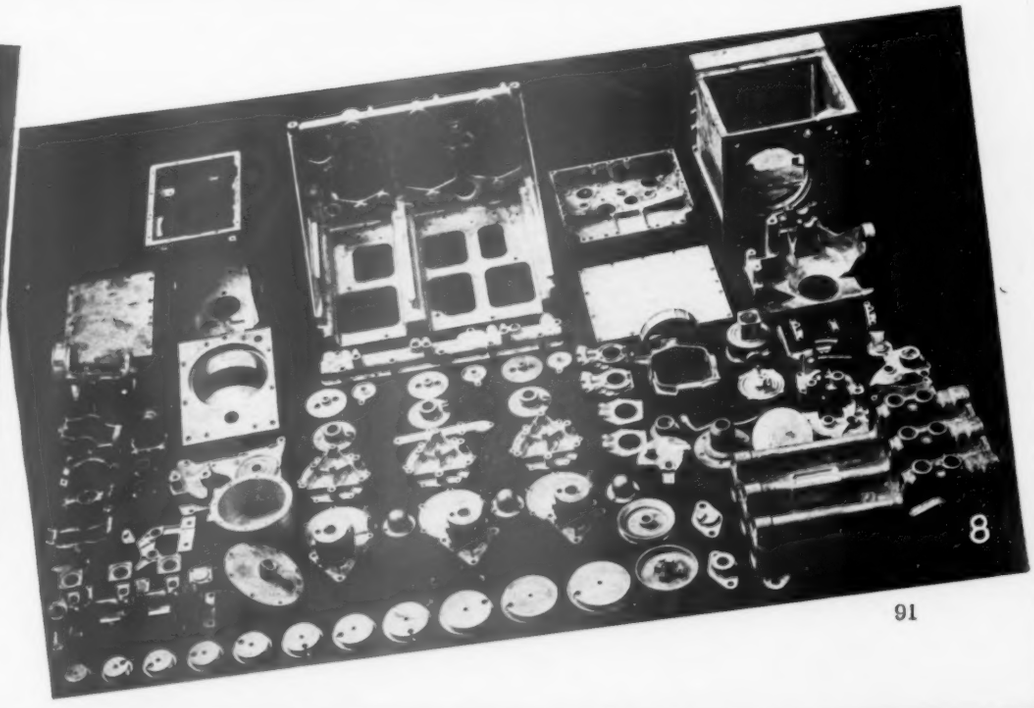

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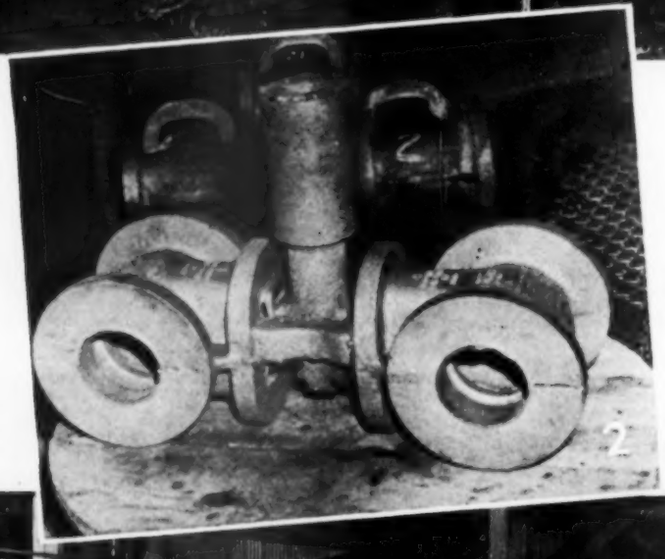

*Fig. 1—Gas-fired annealing oven being lowered over castings stacked on brick hearth*

*Fig. 2—Malleable composition valve bodies which were cast experimentally by centrifuging method*

*Fig. 3—Duplexing installation consisting of cupola and oil-fired, ventilated-bottom air furnace*

*Fig. 4—Electric annealing oven raised to permit withdrawal of car. Small castings are placed in heat resistant baskets for annealing*

*Fig. 5—Vibratory trough conveyor, with castings being discharged from one trough to another*

# Industry Improves Plant Facilities

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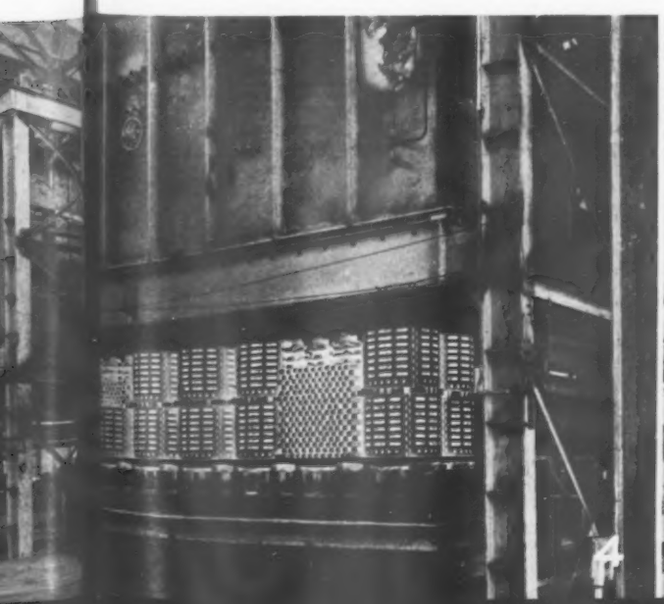
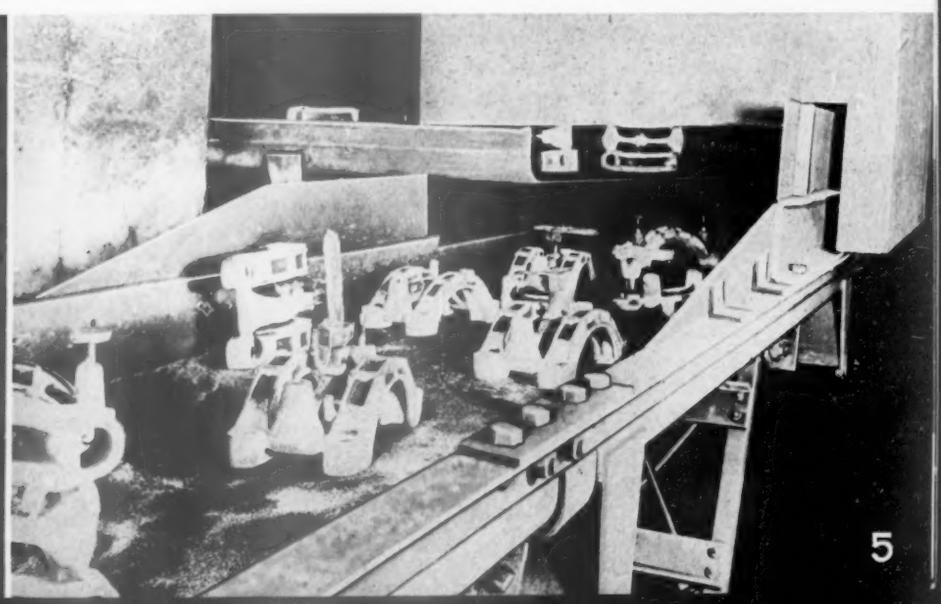
***Modernization of malleable foundries, stimulated by war needs, includes more general adoption of continuous melting, mold conveyors, mechanical sand handling equipment and more efficient types of annealing ovens***

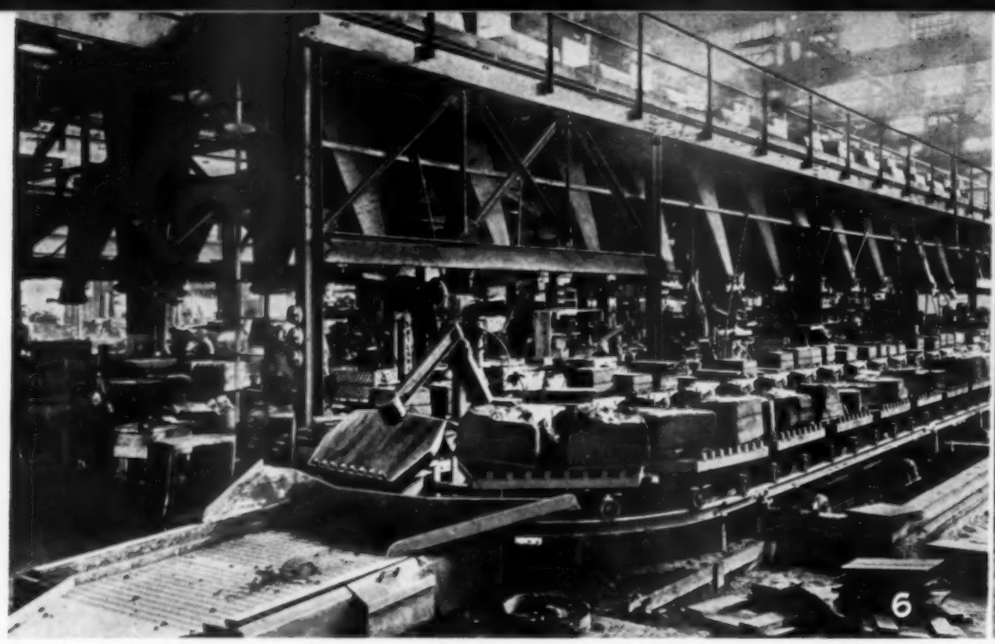
FROM being virtually ignored at the start to becoming one of the very critical of war industries at the end was the experience of the malleable industry during World War II. In time of peace and in the early period following our entrance into the war, malleable iron as a material for military applications received only slight consideration. While it was being used for many cast parts of mechanized equipment—including differential carriers, rear-axle housings, and steering-gear housings for military trucks— nevertheless malleable iron was then seldom identified as a critical material in the war effort.

As the war program swung into high gear, the Malleable Casting Technical Committee was formed to co-operate with the various government agencies and the foundries to furnish assistance on any question relative to the use or production of malleable iron in the interest of the successful prosecution of the war. It was soon realized that the tensile strength, shock resistance, corrosion resistance, and machining qualities of malleable iron, together with its ability to be cast to close final dimensions, were sufficiently impressive to suggest it as a worthy replacement for steel, brass, and even aluminum in many cast parts. Demands for such replacements increased rapidly, and quickly absorbed idle foundry capacity.

As its advantages became known to those individuals in the government agencies responsible for war production, malleable iron was adopted as a material for many important components of military weapons. By 1943, the demand for malleable castings exceeded the capacity of the industry, and the government was forced to provide manpower priorities and financial support for new plants facilities. To satisfy the demands of the ever-acceleratinig war production program, plant expansions and plant modernization became the keynote of the industry. New foundries were built incorporating improved operating practices, machinery and equipment, and many established foundries were modernized to permit substantially higher output in the same floor space and with the same or less labor. These changes in plant facilities constitute the outstanding







developments in the industry during the war. They are certain to improve the position of the industry in the post-war period.

Early in 1944, two government-owned plants, one at Ashtabula, O. the other at Danville, Ill., each with capacity of 2000 tons per month, were put into operation by private industry. These plants incorporated the latest in foundry design and featured high roofs, walls which were principally of glass to provide natural illumination, wide aisles, dust collecting systems for careful control of dust and smoke, and air conditioning to help provide satisfactory working conditions and to contribute to the well-being and comfort of the employees. Plant operations were designed around the "straight-line" production system requiring a minimum of handling of the castings from pouring to final inspection. In both plants, a high degree of mechanization was achieved in material handling by eliminating practically all manual lifting and handling.

### Prepare Iron By Duplexing System

In line with modern plant layout, continuous-pouring units were designed to use cupola-electric furnace duplexing in one plant and cupola-air furnace duplexing in the other.

The cupola-electric furnace installation includes a forehearth or holding furnace to match the continuous melting operation of the cupola with the batch process in the electric furnace. The metal in the forehearth is treated with soda ash to reduce the sulphur to meet malleable iron specifications. Final composition changes and superheating are accomplished in the electric furnace, and standard chemical analyses and visual sprue tests are used for preliminary control. Since changes in physical properties of the metal are frequently more readily explained on the basis of microstructure than by chemical analyses, the constant use of the microscope is very effective as a final control check on both operation and raw material.

In the cupola-air furnace installation, raw materials are stored under cover near the melting department before being transferred to the cupola by the most modern of charging equipment. Metal from the cupola is tapped directly and continuously into the air furnace to maintain a 2-hour supply of metal. The continuous molding and sand handling equipment are typical of modern engineering ingenuity; one of the newer features being the use of low bond, high permeability sands to permit very hard ramming and smooth finishes.

One of unusual features of the Ashtabula plant is the wet type dust collecting system which is provided with ducts through the floor to avoid the usual overhead network of pipes and to provide more headroom above production equipment in the plant.

*Fig. 6—Conveyor handling equipment showing automatic discharge and shakeout in malleable foundry*

*Fig. 7—Car-type mold conveyor carrying molds from closing to shakeout automatically and continuously*

*Fig. 8—Another view of car-type mold conveyor in malleable foundry*

*Fig. 9—Coal pulverizing unit employed in malleable foundry to provide fuel for cupola-air furnace duplexing installation*

*Fig. 10—Molding floor of modern foundry showing conveyor system*

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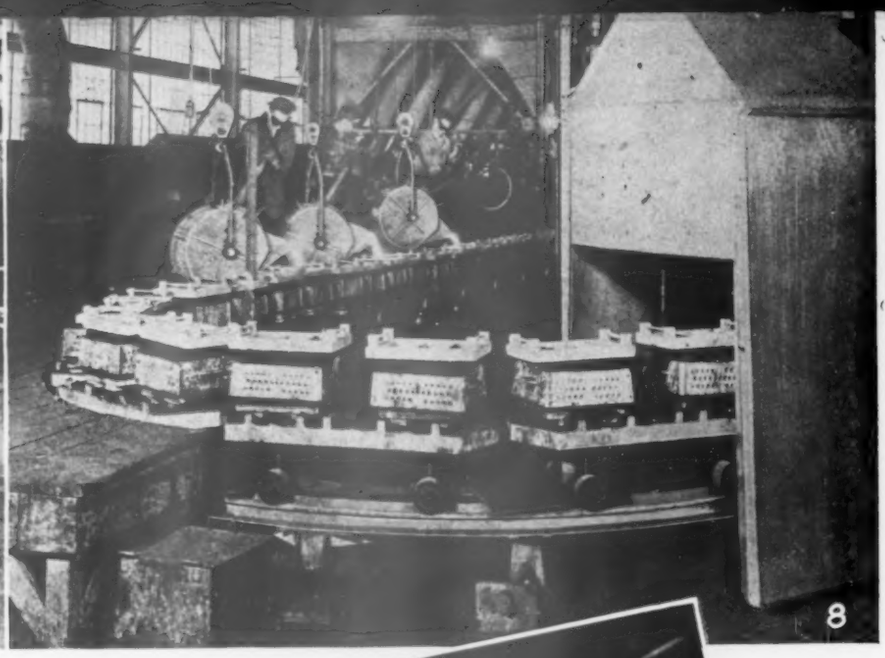

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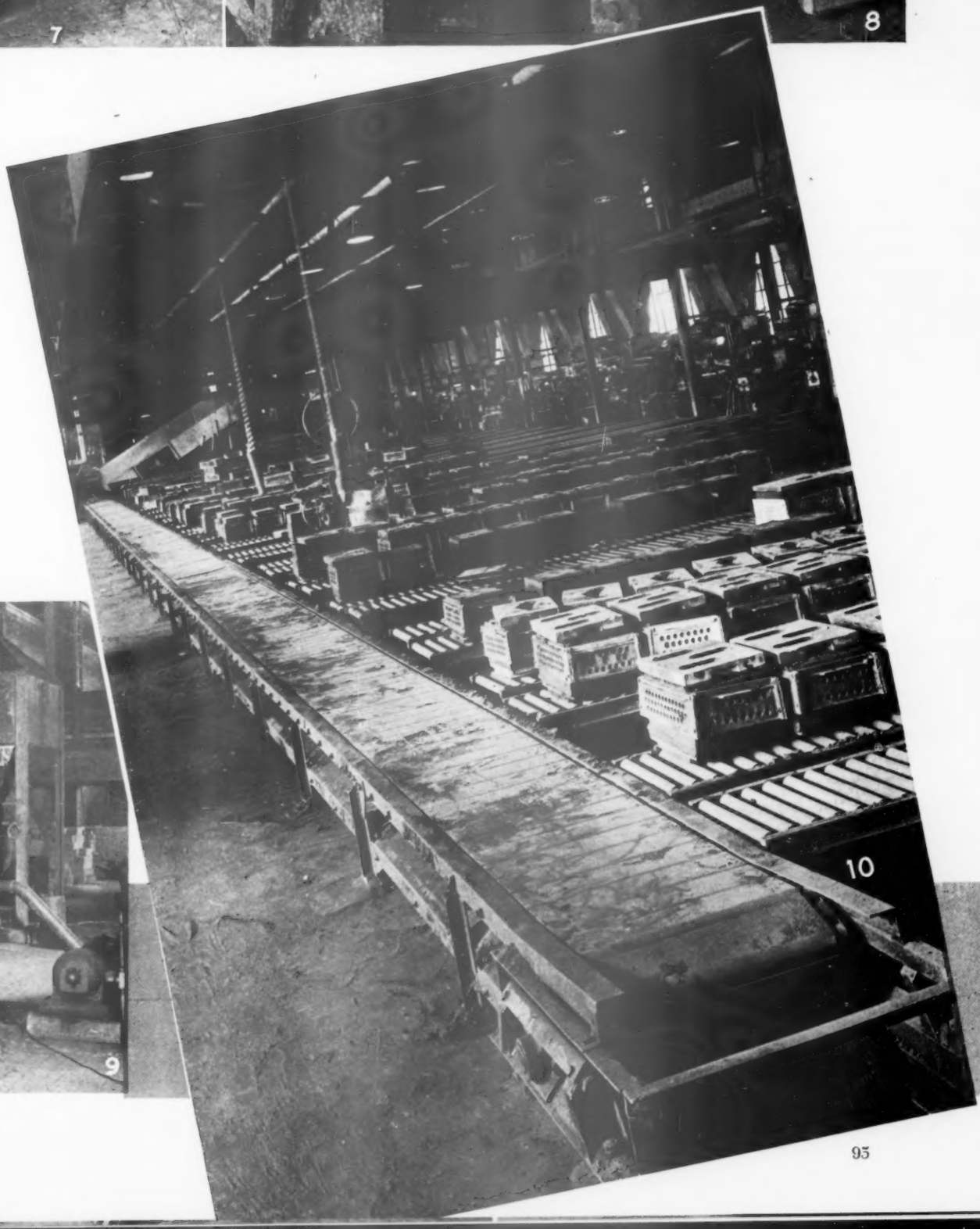

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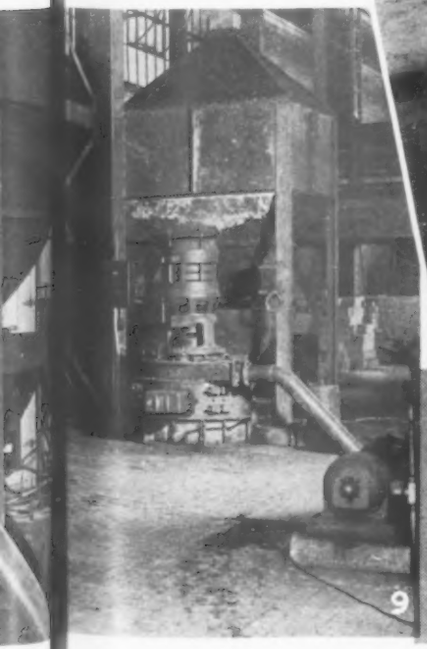

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Annealing in this plant is carried out in 14 elevator car type electric furnaces, one of which is shown in Fig. 4. These furnaces operate in pairs; one for the first stage of the annealing cycle, the other for the second stage of the cycle (the low-temperature portion). Small castings are placed in heat resisting alloy steel boxes, and the larger castings are stood on end between rows of the boxes in the annealing furnaces. Oven temperatures are controlled automatically. This design of annealing equipment has had considerable use in the past, but never to the extent that it is being employed in the foundry at Ashtabula.

### Ovens Lifted from Hearth to Hearth

The annealing method employed at the Danville plant is probably the most outstanding of the new features incorporated into that operation. The equipment comprises 25 brick hearths (76 x 220 in.) on which the castings are stacked, and 19 portable radiant-tube gas-fired ovens which are used to cover the hearths, as shown in Fig. 1. At the end of the annealing cycle, the ovens are lifted by a crane and set over other fully loaded hearths. Each hearth is surrounded by a shallow channel or moat filled with loose sand, in which the oven rests and which serves as an air seal while the oven is operating. Because the gas is burned in a series of metal tubes set in a vertical position, scaling of the castings is prevented, since neither the flame nor the products of combustion are in contact with the castings.

With this new type of furnace equipment, the total time for annealing has been reduced to 72 hours. Temperatures are raised rapidly to 1750 F and held for 25 hours, then dropped rapidly to 1425 F, and finally lowered gradually at the rate of 5° per hour until the castings reach 1300 F. Cooling is then accelerated by removing the oven, allowing the castings to cool to room temperature in air.

A number of the existing plants have, as stated before, been completely modernized, incorporating continuous melting facilities, mold conveyors, and mechanical sand handling equipment to speed production and to counteract the acute shortage of foundry help that was seriously handicapping the industry. Such new installations resulted in substantial increases in output of the foundries without a corresponding increase in labor or without adding to the floor space. The achievements of these installations demonstrated the marked advantages that are possible in certain malleable plants from the use of labor-saving devices, mechanization, and continuous melting. Such mechanization has aided greatly the good housekeeping which is so essential to efficient foundry operations and the production of high quality castings, and for attracting and keeping the higher quality personnel.

Not all type of foundries will derive equal benefit from plant mechanization, and although various savings are incident to mechanical handling of sand and molds, those foundries of relatively small size producing short-run miscellaneous castings, have not found it to their advantage to install mechanized equipment. However, these latter foundries have introduced greater efficiency in the handling of materials by the use of various types of industrial trucks for handling metal charges, sand and castings. Foundries have also installed monorail cranes for handling ladles, annealing pots and other containers.

### Malleable Iron Melted Continuously

The trend toward continuous melting was accelerated rapidly during the war until today over half of the malleable tonnage is melted by that method. Fourteen foundries were reported to have installed duplex melting equipment during the past two years, making a total of 39 plants now reported as using continuous melting. Not all of these foundries have mechanized their molding and sand handling practice, but even in plants that are not mechanized, continuous melting was found to offer real benefits in improved scheduling of production and saving of manpower.

A continuous supply of molten metal makes mold conveyors and handling equipment, and other labor-saving devices, practical for the malleable iron foundry, whereas they would be largely ineffective without continuous melting. According to present estimates, a minimum of 4 tons per hour is necessary to warrant the installation of equipment for continuous melting, and (*Please turn to page* 214)

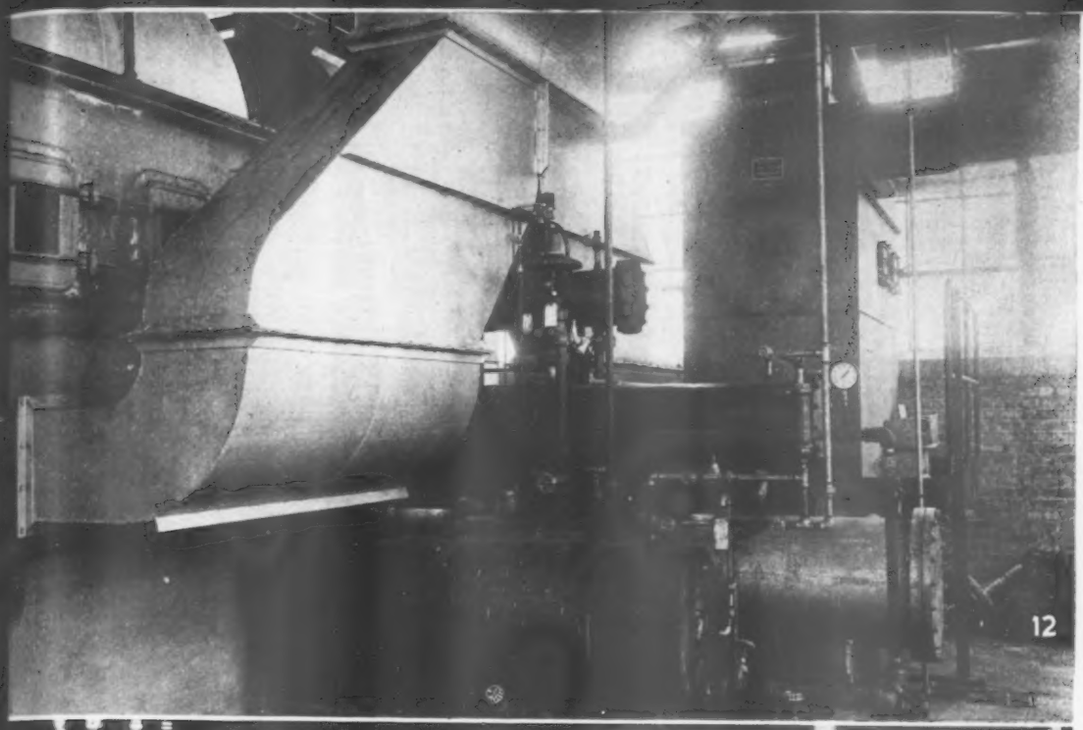


*Fig. 11 — Tapping duplexed malleable iron from pulverized-coal-fired air furnace*

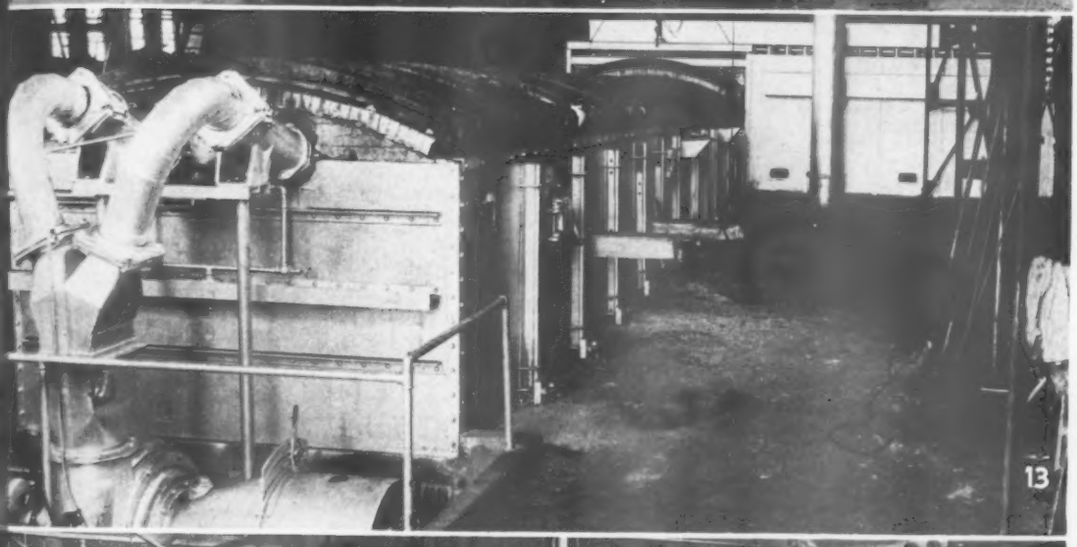


*Fig. 12 — Heavy duty unit in malleable foundry for conditioning cupola blast*

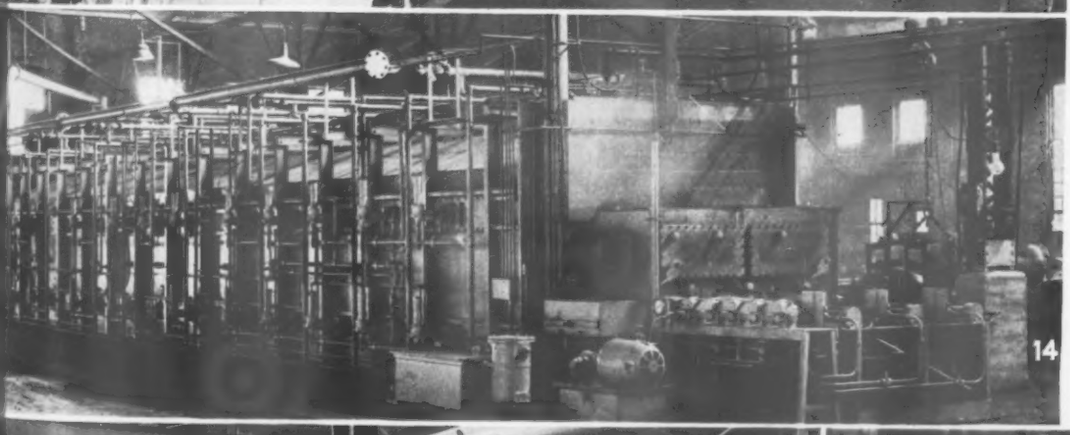


*Fig. 13—Melting furnace utilizing hot air for combustion secured from hollow block lining located in flue from furnace to waste-heat boiler*

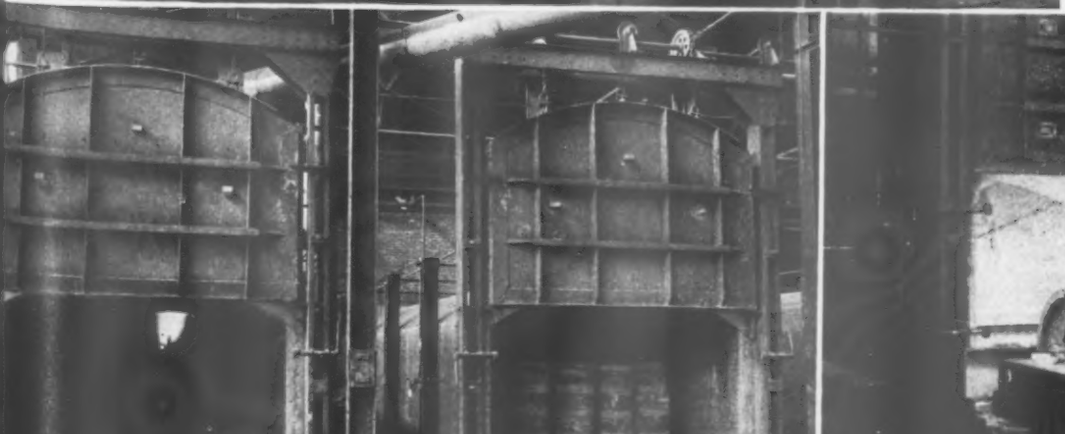


*Fig. 14—Modern radiant-tube continuous malleabilizing furnace*

*Fig. 15—Malleable iron annealing ovens fired by pulverized coal*

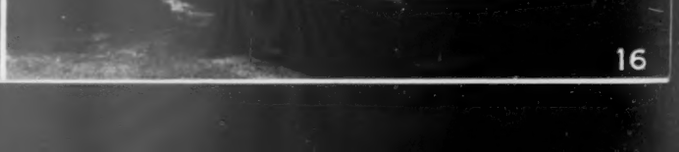
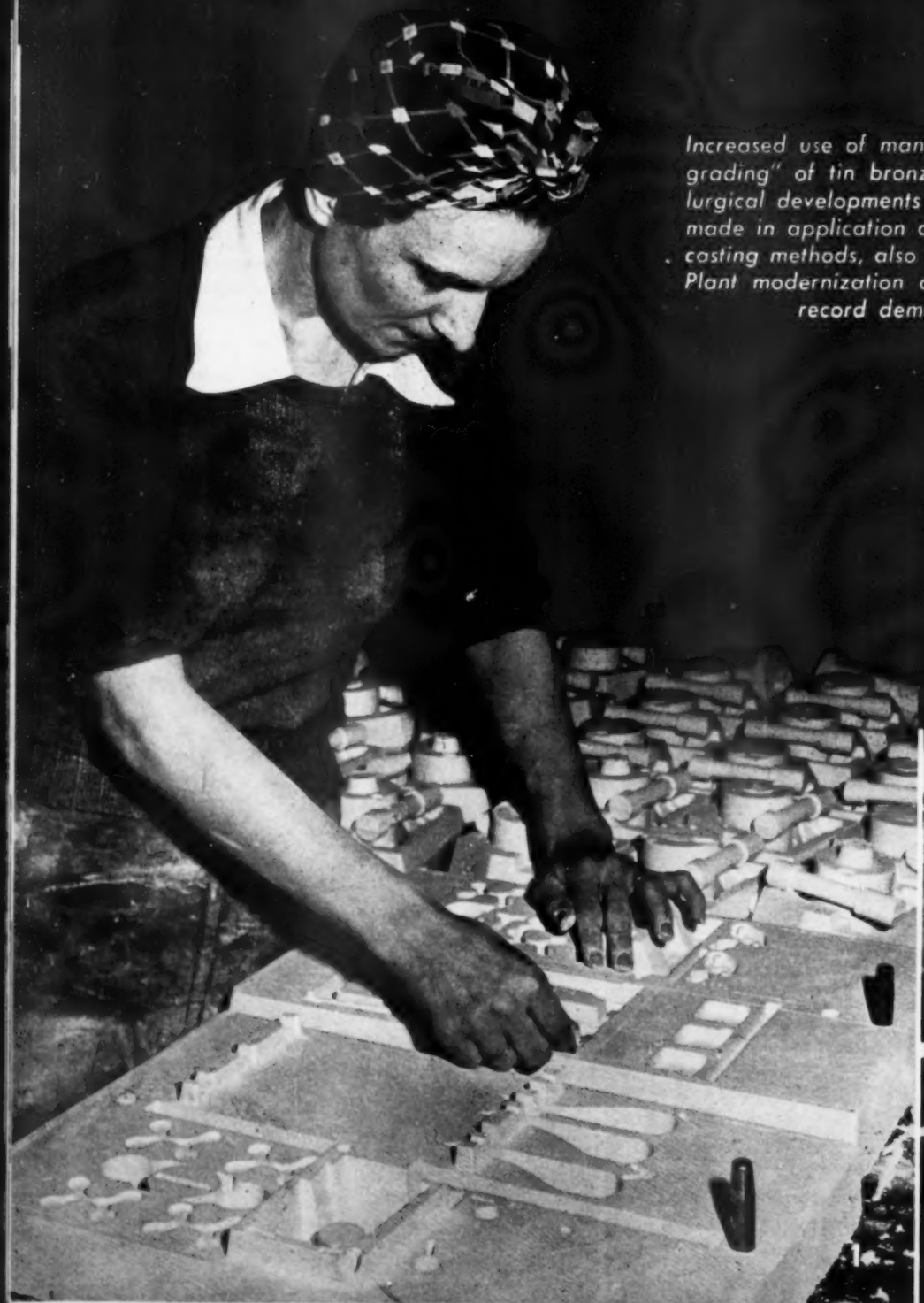


*Fig. 16—Gas-fired, car type furnace for annealing malleable iron*

# BRASS and BRONZE

## FOUNDRIES MAKE METALLURGICAL ADVANCES

*Increased use of manganese bronze and "down grading" of tin bronze were outstanding metallurgical developments of war years. Progress is made in application of centrifugal and precision casting methods, also in cupola melting of brass. Plant modernization and extensions dictated by record demand for castings*



ALTHOUGH faced with a shortage of critical materials such as copper and tin, producers of brass and bronze castings, through ingenuity and resourcefulness, accomplished their wartime job as quickly and efficiently as possible. Many developments which normally would have required years were consummated within a few months. The problems created by the shortage of copper and tin were solved by using known alloys requiring less strategic metal, in applications for which they were not previously considered to be suitable. Centrifugal and precision (cast-to-size) castings were used wherever possible to ensure quality products with a minimum of machining. Carefully controlled molding and melting techniques were developed in order to improve casting quality and thereby reduce the number of rejections.

Probably the most notable of the metallurgical wartime developments in the brass and bronze industry was the increased use of manganese bronze. Because of the difficulty of producing sound castings and satisfactory physical properties, use of this alloy previously was confined largely to the production of marine propellers, in which its strength and resistance to salt-water corrosion were of prime importance. However, intensive research and development of the alloy clarified the understanding of its casting characteristics and composition limits so as to make possible the use of manganese bronze in rings, hollow cylinders, and other small parts, particularly those which may be exposed to corrosive atmosphere or salt spray. Of course, its use was continued in marine propellers such as the 10-ton propeller of the Liberty ship.

The shift to manganese bronze for smaller parts is understandable, since the alloy contains only about 58 per cent Cu and practically no tin; this is in contrast with the tin bronzes previously employed for such purposes which contained from 85 to 90 per cent Cu and from about 5 to 10 per cent Sn. Another advantage of manganese bronze arose from the large potential supply of fired cartridge cases which could readily be

*Fig. 1—Adding cores to baked plaster mold for production of small bronze castings. Although used many years ago as a casting investment, principally in casting statuary, plaster for molds has found increased commercial application more recently where close dimensional accuracy and faithful reproduction of fine details are required*

*Fig. 2—Melting department of modern bronze foundry producing various types of rings. Induction melting furnaces are employed, with two furnaces operated from one generator*

*Fig. 3—Molding floor of same foundry, showing stacks of molds ready for pouring. Machine operators are supplied sand from overhead distributing belt*

converted without deleterious effects on the properties of the alloy. This further increases the supply of copper for other applications.

Manganese bronze contains about 58 per cent Cu, 39 per cent Zn, and about 1 per cent each of Mn, Al, and Fe. Frequently, the alloy contains up to ½ per cent Sn which inhibits dezincification, but which may have a deleterious effect on ductility. Molten manganese bronze is very fluid and easily cast, but because of its narrow solidification range, it is subject to excessive piping which must be compensated by adequate risers. Assuming proper molding technique, gas porosity is rarely encountered, but again, because of the narrow solidification range and the tendency toward oxide film formation, it is difficult to avoid cold shuts and oxide inclusions.

Manganese bronze is supplied in two grades; the high strength alloy having up to 120,000 psi tensile strength with 10-15 per cent elongation, and the second grade exhibiting 70,000 psi tensile strength and 30 per cent elongation. These properties may be obtained with careful control of the chemical composition. The lower strength grade of manganese bronze has been used successfully for ship castings, including massive propellers.

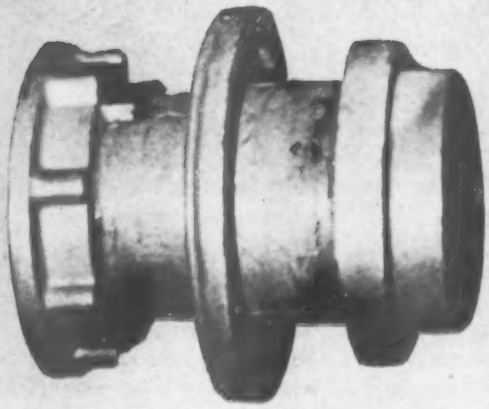
The tin bronzes were "down graded" to aid tin and copper conservation. It was found that many castings normally made only from the best grades of tin bronze (such as Navy "G"—10 per cent Sn) could be produced satisfactorily from the lower tin alloys such as Navy "M", ounce metal (85-5-5-5), or valve metal (81-3-7-9), or even the tin-free alloys such as standard or leaded manganese bronze. It was also found that improved casting characteristics could be obtained at little or no expense to other properties by substituting up to 6 per cent Ni for an equivalent amount of tin in Navy "G." The criterion of substitution in each case was the minimum permissible properties compatible with the service requirements of the completed equipment. The chart and table shown here were issued in September, 1943, by the War Production Board to assist design engineers in specifying compositions which would most effectively conserve tin and copper.

### Silicon Bronze Used Extensively

Silicon bronze is another alloy which was limited in application prior to the war, but was used more extensively as a result of the wartime necessity for tin conservation. A nominal composition for this alloy is 3.25 per cent Si, 4 per cent Zn, 1.25 per cent Fe, and 91.5 per cent Cu. For this composition, an average tensile strength of 50,000 psi and an elongation of 25 per cent may be expected. Though more susceptible to gas porosity, the alloy closely resembles manganese bronze in its melting and casting characteristics. Brackets, housings, and similar castings were made from silicon bronze for the Navy. It was also found to be a suitable substitute for the Navy phosphorus bronze (a tin-containing alloy) which is frequently used as a bearing metal. Though silicon bronze is not a bearing bronze, it is acceptable to the Navy as having bearing properties equal to the cast Navy phosphorus bronze. However, its low resistance to sea-water corrosion and its high copper content placed limitations on the extent to which the alloy could be employed.

Facilities for producing nonferrous castings centrifugally were expanded during wartime. This process was readily adaptable for producing hollow cylindrical shapes and other castings of simple design and was used in many cases to supplant forgings or articles made from wrought material. Castings of this type are characterized by their soundness and freedom from inclusions and generally require a minimum of machining. Inclusions and gas pockets tend to work through to the bore of the casting during the spinning operation, and are subsequently removed by machining. The centrifugal casting process was widely employed for the manufacture of bearings and for certain aircraft parts made of aluminum bronze in which high strength and high quality of castings were of prime importance.

Use of the precision casting method, which has long been known in the dental profession, was extended to the ferrous and nonferrous casting industry. The process of "investment molding" as applied to a metal casting, is one using an expendable pattern and a nonparting mold. Precision casting is a refinement of the investment process to a tolerance of 0.005-in. The casting operation is usually augmented by the use of pressure or centrifugal force. The value of the process depends upon the accuracy of the pattern, and metal shrinkage is compensated in the pattern



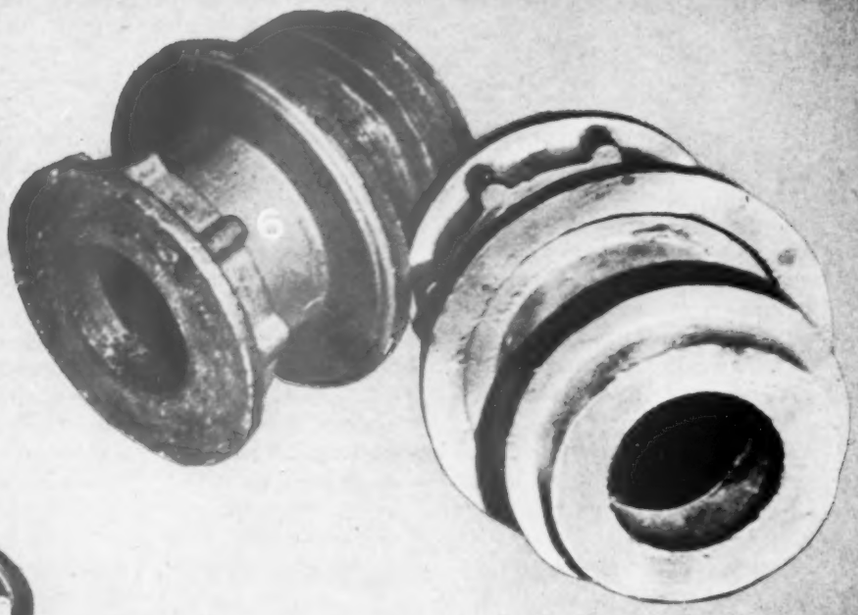


*Fig. 4—As-cast state of housing made from silicon bronze*

*Fig. 5—Two views of centrifugal casting weighing approximately 800 lb as cast. The casting is solid at one end*

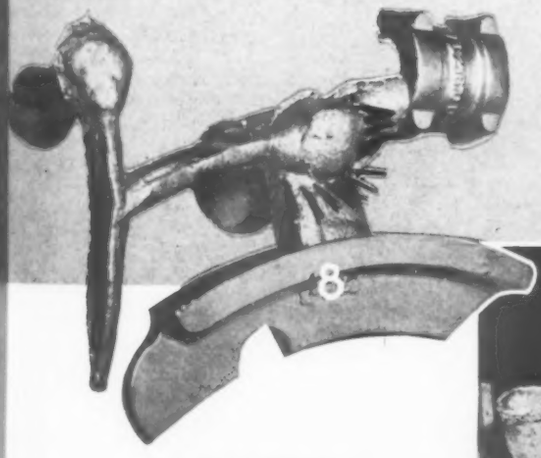
*Fig. 6—Tin-bronze castings made centrifugally, showing adaptability of this casting method to production of parts having irregular but symmetrical contours on the outside diameter*

*Fig. 7—Manganese-bronze castings. Nails grouped around riser trap dross*

*Fig. 8—Method of gating manganese-bronze casting to strain poured metal*

*Fig. 9—Bottom-poured cylindrical casting; dross rises to top and makes it unnecessary to make provision in gates for straining metal*

*Fig. 10—Sand cast aluminum-bronze turntable casting 72 in. in diameter*



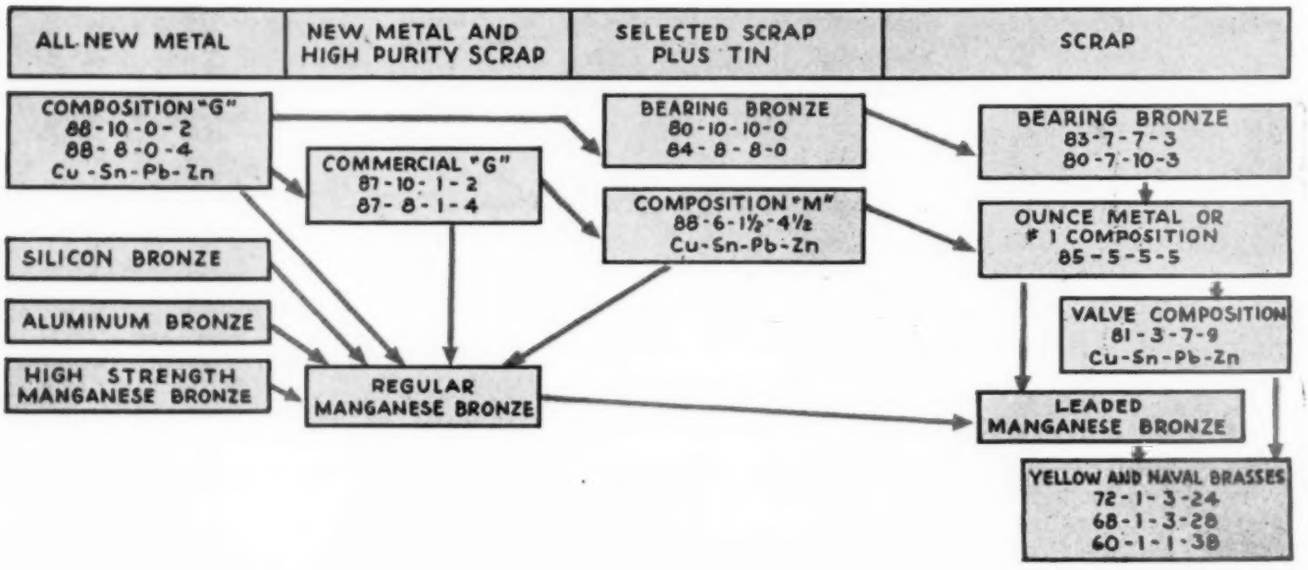
die. The process was employed to manufacture small parts which could be cast to size, thereby replacing forgings or stampings and eliminating machining. Plaster mold casting in the production of small parts to close accuracy likewise found increased application.

Of interest in molding and casting developments is the application of insulating pads and riser sleeves to eliminate shrinkage in bronze castings. Detailed description of this practice appeared in the October and November, 1945, issues of THE FOUNDRY.

During the years preceding the war, bronze foundries met requirements for large capacity by installing new molding and melting equipment in their already crowded shops. However, at the outbreak of the war, foundries were called upon to produce unheard-of quantities of castings requiring complete revamping and the installation of modern equipment.

One such foundry was the bronze unit of the American Hammered Piston Ring Division of the Koppers Co., Baltimore, which was required to make many millions of bronze ring castings to be used as aircraft engine sealing rings, air valve rings, component parts for bronze-iron rings in steam locomotives, steamship auxiliaries and stationary equipment, etc. Forced to revamp the entire shop, many important problems were considered, one of which was the creation of working conditions which would aid in maintaining a high-quality product. To acomplish this, ventilation equipment was installed which allowed for a complete air change every 2½ minutes during warm weather. Two specially designed fans were employed to distribute fresh air to all points of the shop, and at the same time keep the low point of the blast air at a minimum of 7 ft from the floor level. This design prevented the blast of air from reaching the workers, but permitted the hot air and fumes to be carried off above the level at which they are working. The same ventilating equipment was adopted for heating during cold weather by adding high-pressure steam coils.

## METAL CONSERVATION CHART ISSUED BY WAR PRODUCTION BOARD




### SPECIFICATIONS

| ALLOY | ASTM | ARMY & FEDERAL | NAVY | AMS | SAE |
|---|---|---|---|---|---|
| Composition "G" | B 143, 1A & 1B B 60 | QQ-B-691a-5 | 46M 6(INT) "G" | 4845A | 62 |
| Commercial "G" | B 143, 2B & 2C | QQ-B-691a-6 | 46B 5i "P-c" | .... | .. |
| Composition "M" | B 143, 2A B 61 | QQ-B-691a-1 | 46B 8g "M" | .... | .. |
| 85-5-5-5 | B 145, 4A B 62 | QQ-B-691a-2 | 46B23e "Oz-c" | .... | 40 |
| 81-3-7-9 | B 145, 5A | QQ-B-691a-11 | 46B24d | .... | .. |
| 80-10-10 | B 144, 3A | ..... | ..... | 4842 | 64 |
| 84-8-8 | E-B 144, 3Y | QQ-B-691a-8 | 46B22(INT) "H" | .... | .. |
| 83-7-7-3 | B 144, 3B | QQ-B-691a-12 | ..... | .... | 660 |
| 80-7-10-3 | E-B 144, 3X | ..... | ..... | .... | .. |
| Naval Brass | B 146, 6C | QQ-B-621-A | 46B10(INT) "N-c" | .... | .. |
| 72-1-3-24 | B 146, 6A | QQ-B-621-C | 46B11(INT) | .... | .. |
| 68-1-3-28 | B 146, 6B | QQ-B-621-B | 46B11(INT) | .... | 41 |
| Silicon Bronze | ..... | QQ-C-593 | 46B28(INT) | .... | .. |
| Aluminum Bronze | B 148, 9A & 9B | QQ-B-671a | 46B18c | .... | 68 |
| H. S. Manganese | B 147, 8B & 8C | QQ-B-726b B & C | 46B29(INT) "MA-c" | 4862 | .. |
| Regular Manganese | B 147, 8A | QQ-B-726b-A | 49B 3e "Mn-c" | 4860 | 43 |
| Leaded Manganese | B 147, 7A | QQ-B-726b-D | ..... | .... | .. |

Lift-coil induction-type furnaces were acquired to replace the oil-type crucible furnaces. Since practically no heat is radiated from these units, the only heat which tends to raise the temperature of the working space during warm weather is that which is radiated from the molten metal. The furnaces were selected not only to improve the working conditions, but also to increase the production of quality castings. Contrary to expectations, more trouble from porosity was encountered with lift-coil induction-type furnaces than was previously encountered with the oil-type crucible furnace. However, this problem was finally solved by developing a method for charging the crucible and using a covering of silica sand and borax to protect the metal while it is being heated to the correct pouring temperature. A desirable feature of the lift- coil type of furnace is that the metal can be cast at any point in the foundry directly from the crucible in which it was melted.

Molding machines were installed in a straight line and supplied with sand from an overhead distributing belt. A belt spill-conveyor under these machines eliminates the necessity for shoveling excess sand; the excess sand falls through a grating onto a belt and is returned to the storage bin for reconditioning. The molds are prepared with a No. 1 Albany molding sand in shallow flasks and stacked on a cast iron dolly mounted on four specially designed ball-bearing wheels, so they may be conveyed easily from molding machine to pouring station, and then on to the shakeout. The shakeout station has a belt conveyor which returns the sand to the storage bin to be reconditioned. The castings are sandblasted within 3 hours after molding, and inspected immediately thereafter.

Cupola melting of bronze also has received a good deal of publicity during the war. The process has been in general disfavor because of supposed inability to control chemical analyses. However, several makers of bearing metals now have cupola melting under good control, and have demonstrated that sufficiently accurate results may be obtained. The cupola provides a (*Please turn to page* 218)



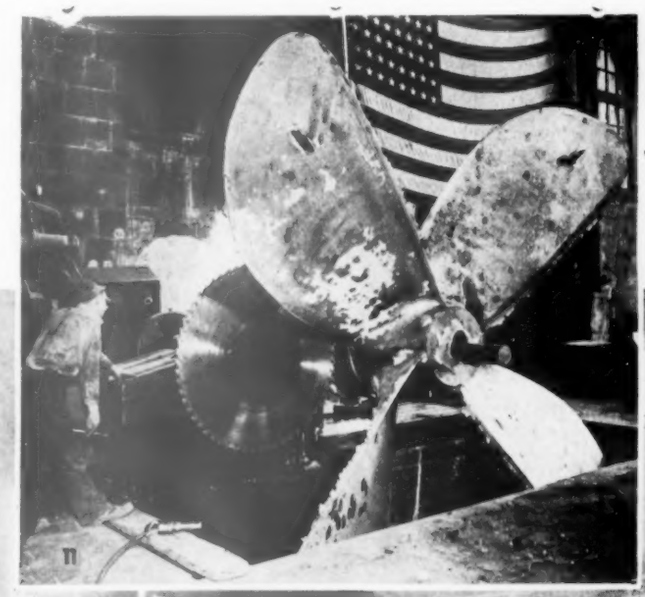


*Fig.* 11—*Cutting sinkhead from manganese-bronze propeller*

*Fig.* 12—*Pouring manganese bronze for ship propeller*

## Wants Smooth Surface on Work

**Q.**—We are planning to open a shop and include in it a small foundry. What we would like to know is how to obtain a smooth mirror finish on ornamental castings of brass or bronze.

**A.**—Your question relative to the surface finish of brass and bronze castings has two possible answers. One is concerned with the appearance after the usual cleaning operations to remove sand, and the other is further treatment to secure an extremely smooth surface. Since the metal resting against the sand face of the mold to a large degree reproduces the texture of that sand, the smoothest surface will be obtained by the finest sand. Unfortunately, fine-grain sands are low in permeability, but a compromise is effected by applying only a thin coating or facing as it is termed, of that material next to the pattern and backing it up with coarser sand.

Still further smoothness can be obtained on brass and bronze castings by water tumbling or by use of wet blasting. In the former method the castings with stars or balls are placed in a tumbling barrel which is immersed in water. After several hours tumbling the casting surfaces become quite smooth. However, if sharp corners must be maintained on the castings, the method is not satisfactory. In wet blasting the castings are subjected to the action of a stream of water under high pressure which carries sand.

To obtain a polished and buffed surface which might be what you have in mind the surfaces of the castings are subjected to the action of abrasive faced wheels in several steps with the abrasive becoming finer with each step. The polishing wheels used are made of disks of muslin or canvas sewed or glued together. The periphery of the wheel is covered with a coating of glue and then rolled in the desired abrasive. Size of the abrasive grit used in each step and the number of steps will depend upon the original smoothness of the casting surface and that desired at the end of the various operations. If the casting surface is reasonably smooth the first or roughing operation can be accomplished with No. 80 grit followed by polishing with wheels set up with No. 120 and No. 150 or No. 180 grit abrasive. If the castings are somewhat rough and the No. 80 grit does not clean them rapidly enough you will have to start with a coarser abrasive such as No. 60 and follow through with the others. Final finish is accomplished by buffing using loose-sewed muslin wheels to which may be applied a suitable buffing compound containing tripoli, lime or chromium to provide the desired lustre.

# Questions and Answers

## Remove Moisture From Plaster

**Q.**—We would like to obtain information on how to extract the moisture from plaster molds used for the production of brass castings.

**A.**—Removal of moisture from plaster molds is accomplished by the application of heat, and the length of time required for the operation will depend on the temperature. At comparatively low heat such as is obtained in a core oven—500 F—the drying will require from 10 to 12 hr while if the temperature is raised to 1300 F, the same results can be accomplished in about 3 to 4 hr. Hence, the practice is to employ a time-temperature cycle which will meet the particular production needs.

For example, in making pressure cast matchplates which is not a production proposition, usually ovens similar to core ovens, operating at say 600 to 800 F, are employed while in the case of quantity production of small brass castings, continuous ovens employing temperatures of 1300 F are used for drying. After the molds are once dried, they should be filled with molten metal as soon as they can be handled out of the oven. If allowed to become cold, the plaster will tend to reabsorb moisture which will cause blows.

## Figure Weight From Drawings

**Q.**—Is there any book available on the subject of selling steel castings? The book should contain instruction and data on estimating the cost of patterns, and on how to estimate weight of castings from blueprints.

**A.**—So far as we know, no person up to the present has written a book of instruction on how to estimate the weight of castings cost of patterns, etc., as a guide to selling castings. Estimating the weight from a drawing is comparatively simple. The drawing is broken down into as many parts as may be necessary. Cubical content of each part is figured in inches. Items are added together and the total is multiplied by the constant 0.26 for gray iron, 0.28 for steel and 0.30 for bronze. The result is the weight of the casting in lb. The Data Sheet in the October and November issue of THE FOUNDRY covers that feature in a

clear and concise manner. However, many other features are involved, features included in a list that can be learned only through actual shop knowledge and experience.

For example: The estimate of a given casting might show 1000 lb. Production of the casting might involve the use of feeding risers varying in weight from 100 to 1000 lb. Obviously the cost of producing one is greater than the cost of producing the other. In another example the casting weighs 10 lb. Unless the salesman is widely experienced he does not know how many castings can be made per day or per hour. If he decides that a man can make 100 per day, and the actual output is only 50, his profit is zero or less. A third example applies to two extremes frequently found in general jobbing shops. One casting, a plain, solid body, weight 2000 lb can be made in a day by one man. A second casting, same weight, but different shape and size, and filled with many intricate cores might engage a man fully for 2 days. At $10 per day, cost of molding the first casting is ½-cent per lb. On the other the cost of molding labor is 1 cent per lb. Intelligent bidding on castings involves a great deal more than the ability to read a drawing and figure the weight.

## Iron Hard For Light Castings

Q.—We are melting approximately 6000 lb per day in a cupola lined to 34 in., diameter. A force of 20 molders working by hand produce a wide variety of light castings, agricultural implements, wood and coal furnaces, furnace and stove grates, fire pots, medium and light machinery parts, etc. We have on hand two grades of pig iron, one with a silicon content of 3.25 per cent, and one with 0.80 to 1.00 per cent; also a supply of light machinery scrap and rusted stove plate. On the coke bed we charge 200 lb of the high silicon pig iron and 800 lb, remelt gates and risers. With 60 lb of coke between, subsequent charges contain 150 lb high silicon pig iron, 100 lb low silicon pig iron, 125 lb machinery and stove scrap, 125 lb remelt. We are inclined to the opinion that the silicon content is too low for our light castings.

A.—Long distance diagnosing without a knowledge of all the factors and local conditions is a rather risky performance. Your practice of placing a double weight charge of iron on the bed is in the debatable class. However, presumably it is satisfactory since you make no reference to dull iron. The remaining charges of coke and iron, 60 lb coke to 500 lb iron conforms to modern cupola practice. Two other items cause us to lift an eyebrow. A daily heat of 6000 lb seems light for a crew of 20 men. A total of over 2000 lb of remelt, 800 lb on the first charge and 125 lb on each of the succeeding 10 charges, is higher than usual. However, your direct question is in connection with the composition of the iron.

A suitable analysis or the general run of light castings would show: Si 2.50 per cent, Mn 0.50 per cent, P 0.60-0.70 per cent, S under 0.10 per cent. Assuming—and this merely is a guess—that the silicon content of the remelt and the outside scrap is under 2.00 per cent, and allowing a silicon loss of 10 points in the melting, the iron going into the castings has a silicon content of approximately 2.00 per cent. That is too low for thin castings. The situation may be remedied by any one of three methods: (a) Increase the amount of 3.25 pig iron in the present mixture. (b) Add from 10 to 20 pounds silvery iron (15 per cent silicon) to the present mixture. (c) Add silicon briquets or lump ferrosilicon to the present mixture.

## Tellurium Information Given

Q.—We recently read an article in THE FOUNDRY which referred to the use of tellurium in the production of chilled car wheels, and are wondering whether you have any information on the effect of that material on ladle linings. We have heard that when a siliceous refractory is used the operator cannot control the depth of chill. It also has been reported that a ladle lining with graphite in it creates a soft slag which pours into the wheel.

A.—So far as we know no particular trouble has developed in ladle linings with use of tellurium. Possibly the trouble in lack of chill control with the siliceous lining arises from some other cause. For example, tellurium has a boiling point of 2530 F, and tends to distill off at that temperature. Hence, if the iron is held too long before pouring, little if any tellurium may be left. Therefore, the time element like that in the case of certain other addition agents is important in using tellurium. Incidentally, mention was made in the November, 1944 issue of the use of tellurium in a mold wash to obtain chilling in specific areas. In such application the tellurium would be in close proximity to siliceous material (molding sand), but apparently the only trouble might be as indicated in the December, 1944 issue, migration.

As far as graphite in the lining is concerned, we would be hesitant in using it with tellurium since the effects of those are directly opposite. While in car wheel manufacture graphite or scrap electrodes and tellurium are used together, a definite ratio (30 to 1) is maintained since the rate of absorption of carbon from those materials is known. With graphite in the lining we believe that it would be difficult to maintain or control the ratio. However, we cannot see why a soft slag should be formed any more than in the case where the graphite or electrode floats on the top of the molten bath in the ladle.

## GANGWAY!

By J. A. Patterson

"How long did you say Hapgood was stationed with the Army in India?"

## Desires Technique for Slush Castings

**Q.**—We have purchased a number of 3-piece bronze molds for casting white metal parts for portable lamps, and a supply of slush metal. We would like to obtain information on techniques employed in making hollow, white metal castings usually referred to as slush castings. This should cover alloys, preheating molds, pouring temperatures, revolving molds to produce centrifugal force, cooling time before dumping excess metal, etc. We also would like to make our own permanent molds for such work, and would like to obtain handbooks or advice on their manufacture.

**A.**—Production of slush mold castings, while not difficult, does require a considerable amount of experience in determining the time interval that the metal remains in the mold before dumping, and the amount of cooling before the mold is used for the next casting. Principal metal used for slush casting is a zinc-base alloy similar in composition to that used for die casting, although for some work antimonial lead (14 to 18 per cent Sb), and brittania may be used.

Slush molds, as you mention, usually are made of bronze and in two or more sections which are clamped together. The whole is mounted in trunnions so that it can be turned over to permit the still liquid metal to run out after a suitable time interval in the mold. General arrangement of a slush molder's station is a work bench on which the mold is set up with a hot metal furnace at the right, and a water tank at the left for cooling the mold when desired. Metal melting furnace should be equipped with automatic controls so that a uniform temperature can be maintained. Melting temperature of zinc is about 788 F, but of course, that is not sufficient to pour satisfactory castings. Usual pouring range is from 25 to 75 F above the melting temperature or around 815 to 860 F. Most suitable temperature will have to be determined by experience and will depend upon the size of the casting, mold operating temperature, etc.

Molds usually are operated at elevated temperatures of a few hundred degrees which will have to be determined by experiment. Method of raising mold to desired temperature is accomplished by pouring a few waster castings at the start of operations. Molds must not be permitted to become too hot as that increases the length of time for the metal shell to form—and decreases the rate of production. Time interval that the molten metal remains in the mold before dumping depends upon the desired wall thickness for the casting. In some cases desired wall thickness is obtained by the time the mold is filled.

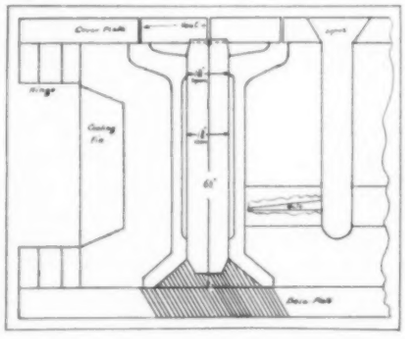
Filling the mold is accomplished by dipping molten metal from the furnace pot with an iron ladle. Size of the ladle should be such that only one dip will be sufficient to fill the mold. Pouring practice is similar to that for other casting methods—a strong, steady flow of metal to keep the downgate full. While you mention revolving molds to produce centrifugal force, we do not believe that such practice is employed in slush casting.

Bronze molds for slush casting usually are made in plaster molds, since by that procedure an extremely smooth face is obtained which requires the minimum of finishing before use. Also the plaster process is particularly applicable where several molds are to be made to produce the same casting since any desired number of pattern replicas to form the mold face can be made from the master mold.

## Faced by Problems of Permanent Molding

**Q.**—We are contemplating making certain gray iron castings in permanent molds. We shall appreciate your advice on the best gating method, also the composition of the iron in the permanent mold, and the size and position of the water cooling chambers.

**A.**—Certain general features or principles applicable to all permanent mold castings may be presented, but attention is directed to the fact that no two problems are exactly alike. Each type of casting presents a particular problem. Fabrication of suitable materials into dies or molds, properly designed for production and reasonably long life is worthy of careful consideration. The subject has been discussed extensively among foundrymen and engineers in recent years. If you have not already consulted the literature we should advise looking up articles that have been presented in THE FOUNDRY. The subject also is treated in 3 chapters of the book "Gates and Risers" for castings. Through space limitations our present reference necessarily is brief. The problem requires study.



*Detail of one part of permanent mold split vertically through the center and designed for two mold cavities to be filled from a single sprue. Center core is sand*

Molds are made from a strong, high test iron of the following approximate analysis: TC 3.30 per cent, Si 1.20 per cent, S and P under 0.10 per cent, Mn 0.80 per cent. According to some reports the molds are improved to a considerable extent by addition of small amounts of nickel and chromium. Castings are heat treated properly before they are turned over to the die maker. Heat treating relieves any inherent strains or stresses which might cause trouble when the mold is subjected to sudden changes in temperature in service. Shrinkage allowance in permanent mold construction for gray iron is 0.004 in. per in.

The most suitable place for parting and the most convenient method of opening and closing, removing cores and ejecting castings must be determined from the nature of the casting. No fixed rules are available for locating gates. A generally safe rule is to gate the casting as low as possible with a view of the metal forcing the air out as it ascends in the mold. The first gate should be made relatively small. It readily may be enlarged if necessary after initial trials. Wide thin gates usually are preferable. Mold faces for gray iron castings are coated with a thin refractory material and in addition are smoked with an acetylene torch.

In the present instance we should suggest a mold with two cavities served by a single sprue. Later, after the experimental period, and if conditions warrant, a longer mold can be made with 12 to 18 cavities, but always in pairs with a sprue serving each pair. Modern type permanent molds are not water cooled. They are operated at a fairly high temperature and are maintained at the desired temperature by natural or artificial air blast playing upon ribs or pins on the outside of the mold. Unless you have had extensive experience in the design and use of permanent molds, we are inclined to the opinion you will save money and escape a severe headache by turning the job over to a specialist.

## Soot and Carbon Give Trouble in Oven

**Q.**—We are troubled with soot and carbon in our core oven and are wondering if there is some chemical which can be put in the oven to burn them out. We have adjusted our oil burner, and do not believe that the trouble is from that source.

**A.**—Since you mention that you already have made adjustments to the oil burner supplying heat to the core oven, there appears to be only one other feature that might bear investigation. That is the

(*Concluded on page* 108)

☆ ☆ *Nickel*

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**Nickel also serves as a valuable tool within the foundry itself by alleviating such problems as porosity, shrinkage, chilled corners and edges and non-uniformity in castings of irregular section or unusual design.**

**Suitable forms of Nickel and Nickel alloys have been developed to simplify its use by both ferrous and non-ferrous foundrymen.**

★

*Our technical staff and the casting specialists of our distributors have had many years of experience with foundry problems. They will welcome the opportunity to cooperate with you.*

**THE INTERNATIONAL NICKEL COMPANY, INC.** 67 WALL STREET NEW YORK 5, N. Y.

(*Concluded from page* 106)

ventilation of the oven. Perhaps it is not quite adequate enough to carry off the products of combustion which are generated during the baking period. It is quite possible that the stack or ventilating pipe does not extend sufficiently above the adjoining roofs to provide a good draft at all times.

After looking into that phase and you still are bothered with soot and carbon deposits, you will have to go back to a consideration of the oil burner since that is the only other possible cause. Possibilities along that line are insufficient air and insufficient preheat of the oil, or both. Also it might be that the oil and air are not sufficiently mixed to provide the best combustion conditions. Proper adjustment of the burner may require service of a combustion expert, and we suggest that you get in touch with the manufacturer of the oven, or the maker of the oil burner, or with the supplier of the oil which is used.

## Bridge Is Formed Above Cupola Tuyeres

Q.—Blast for our 22 in. diameter cupola is supplied by a fan run by a 7½ hp motor 1160 rpm from line shaft. Each charge consists of 500 lb iron, 50 lb coke and 20 lb limestone. Is 500 lb too heavy for a charge in a 22 in. diameter cupola. This iron is hot for the first six charges, then gradually grows colder and melts slower as a result of a slag bridge forming above the tuyeres. We attempt to tap the slag after the third tap, but with indifferent success. The slag hole freezes up after the fifth or sixth tap. The cupola charge is made up of pig iron 55 per cent; sprues and shop scrap 20 per cent; miscellaneous foreign scrap, agriculture, stove plate, boiler sections, machinery, 25 per cent. Analysis of pig iron shows: Si 2.77 per cent; S 0.05 per cent; Mn 0.76 per cent; P 0.30 to 0.50 per cent. We should like to use 70 to 80 per cent pig iron in the mixture. What kind of pig would you recommend?

A.—From the opening statement we cannot determine whether the 1160 rpm refers to the speed of the motor, the fan or the line shaft. Properly operated a 22 in. inside diameter cupola has a melting speed of approximately 4000 lb per hour and requires about 60,000 cu ft of air, or 1000 cfm. Your present motor and fan are too large. Presumably they were employed before the cupola diameter was reduced from 32 to 22 in. Outside of wasting power, the present motor and fan may operate satisfactorily at reduced speed, or at full speed with a gate in the blast pipe. For correct size of line shaft driving pulley, and speed of motor and blower we suggest you telephone or write the local representative of the fan manufacturer.

Remainder of the inquiry, general cupola operation involves too many features to be treated satisfactorily in the space at our disposal. The following brief comment is offered for your consideration. A small cupola requires more expert manipulation than a large cupola. A 500 lb charge is not too large for a 22 in. cupola, provided the total melt does not exceed five or six charges; and more particularly if the iron is broken into small pieces. It is too large if the heat extends much over an hour, and if the greater part of the charge is made up of large pieces of pig iron. With a high bed and short heat a ratio of 1 to 10 coke and iron will work satisfactorily. For longer heats the proportion of coke to iron must be increased, either by adding a little to each charge or by using a double charge of coke at intervals of about an hour. This is to renew the height of the bed and to maintain a maximum temperature in the melting zone. With excessively large iron charges and skimpy coke charges the iron is not raised to maximum temperature while passing through the melting zone. Also the charge remains too long in one place. This is one of the contributory causes of bridge formation. Break the pig into small pieces, reduce the amount to 300 lb, and throttle your blower down to a delivery of about 900 cfm.

## Silicon Is Raised for Light Castings

Q.—In our 34-in. diameter cupola we melt a daily heat of 6000 lb, a 1000 lb charge on the bed and ten 500 lb charges. We have on hand pig iron with a Si content of 3.25 per cent, pig iron with a Si content 0.80 to 1.00 per cent, light machinery scrap and stoveplate. We also have to use up 2000 lb of remelt each day. The first charge contains 200 lb high silicon iron and 800 lb remelt. Succeeding charges are made up of 150 lb high silicon pig iron, 100 lb low silicon pig iron, 125 pounds foreign scrap and 125 lb remelt. We shall appreciate your suggestion for a more suitable mixture for pouring light castings. A recent analysis of the iron shows Si 2.10 per cent, S 0.114 per cent, P 0.52 per cent, Mn 0.56 per cent, TC 3.39 per cent. How can we lower the sulphur and carbon? Where can we procure silvery iron, silicon briquets or other materials. Should these items be added in the cupola, the spout or the ladle.

A.—So far as we can see the only items that required to be changed are the silicon and sulphur. Names and addresses of manufacturers of materials for this purpose may be found in the advertising pages of THE FOUNDRY. You probably can order them through your local foundry supply house. These companies have available foundry experts and trouble shooters who will be glad to discuss the subject with you and give you the benefit of their experience. Satisfactory iron for light castings conforms to the following specification: Si 2.50 per cent, S under 0.10 per cent, P 0.50 per cent, Mn 0.70 per cent, TC 3.30 per cent. Silvery iron, lump ferrosilicon and briquets are added to the cupola charge. Powdered ferrosilicon is added to the stream in the spout. Proprietary sulphur reducing materials may be added to the cupola charge or introduced to the metal in the ladle. Cost of the various ingredients is the principal factor in making up a cupola mixture. You have three alternatives: Increase the amount of high silicon pig iron; add a small amount of silvery pig iron; or add silicon briquets or ferrosilicon.

## Scrap Is Broken Up For Cupola Use

Q.—We are investigating the best possible method for preparing scrap for use in our cupolas. We shall appreciate reference to any published information on the subject. Do the large automotive foundries use a jaw crusher for this purpose? Kindly give us a broad outline.

A.—A few years ago when scrap was so plentiful, the foundries were in position to enforce a demand for scrap, broken, cut, baled, or otherwise in suitable condition for use in the cupola. Specifications were drawn up indicating classification, size and weight of the scrap. In a general way no piece was to be too heavy for one man to lift, or too large to go through the charging door. During the recent emergency the supply of scrap did not equal the demand and as a result, the position of buyer and seller was reversed. Foundries, in many instances bought scrap which would have been rejected under former normal conditions. The foundryman had to install equipment and bear the added expense of reducing large pieces of scrap to suitable size for charging in the cupola.

Pieces too large to be broken with a sledge hammer are broken under a drop ball or a heavy tup moving up and down in a pair of vertical slides. The ball is lifted by a cable attached to a crane, or to a small hoisting engine or motor driven winding drum. The ball may be lifted by a magnet actuated from the hoist, or may be attached to the free end of the cable by a hook with a self-tripping mechanism which releases the load at a predetermined height. Pieces too large to be broken in this manner are cut into sections by oxyacetylene torch. Steel scrap is cut with a torch or in an alligator shear. Hydraulic presses are employed to compress steel shavings and small miscellaneous thin plate scrap into compact bundles. Hydraulic presses also are employed to convert turnings from the machine shop.

says Mr. C. A. Miller, superintendent of Bosworth Foundry Co., Chicago, producers of bronze, red brass and aluminum castings weighing from a few ounces up to 1,200 pounds. Mr. Miller added: "The Royer takes out the scrap which can cause a lot of discount if left in the sand."

Reports like the above come from users of the Royer Sand Separator and Blender because it alone provides these six essential steps to thorough sand preparation.

1. The automatic removal of contamination from the sand.
2. Reducing the sand to a smooth, even texture, free of lumps.
3. The proper blending of old sand, new sand and bond.
4. The correct distribution of moisture.
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Each of these "six points" was a factor in the results obtained at Bosworth Foundry and in all the Royer-equipped foundries—large and small, ferrous and nonferrous, jobbing and production.

Royer-conditioned sand is of greater value than ever, with competitive conditions back again. Clean sand minimizes surface defects, reducing discount losses substantially. It provides smoother casting surfaces, which result in lower cleaning room cost. The Royer reduces sand conditioning costs, as the only labor required is shoveling the sand into the hopper. The rugged, trouble-free machine does all the rest.

Over 7,000 Royers are now in service. There is a model, stationary or portable, for every foundry requirement. Write for Bulletin 744, which pictures all Royer models and shows typical foundry installations.

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# MEN of Industry

CHESTER V. NASS

CHESTER V. NASS, manager of the foundry division, Pettibone Mulliken Corp., Chicago, since 1942, has been elected vice president. A native of Granville Ferry, Nova Scotia, he was graduated from Tufts College in 1923 and was associated with the Ohio Brass Co., Mansfield, O., for five years, first as assistant metallurgist and later plant metallurgist. In 1928 he joined the Humphreys Mfg. Co., Mansfield, O., resigning the following year to accept the position of brass foundry superintendent with Fairbanks, Morse & Co., Beloit, Wis., where he remained until he joined Pettibone Mulliken in 1942.

♦ ♦ ♦

PAUL E. TAMPLIN

**Paul E. Tamplin,** general superintendent of the Sharon Works, National Malleable & Steel Castings Co., since 1943, has been appointed manager of the new sales and service department established at that plant. Mr. Tamplin, a native of Sharon, has spent his entire business career with the Sharon works, beginning in 1908 as a messenger boy. He became purchasing agent in 1918, assistant superintendent in 1936, and general superintendent two years ago.

♦ ♦ ♦

**Richard B. Kropf,** metallurgist, and formerly district manager of the Copperweld Steel Co., Hartford, Conn., with whom he has been associated since 1941, has joined International Nickel Co. Inc., where he will be in charge of the new Cincinnati technical section of its Development and Research Division. Mr. Kropf, a graduate of Michigan College of Mining and Technology and the University of Wisconsin, became associated with Copperweld in 1941. Other previous connections include Republic Steel Corp., South Chicago, Ill., Globe Steel Tubes Co., Milwaukee, and A. O. Smith Corp., Milwaukee.

♦ ♦ ♦

**Bert J. Aamodt,** manager of industrial steel sales for the Chicago and Melrose Park works, National Malleable & Steel Castings Co., since 1943, has been appointed manager of industrial sales for the two plants, covering both malleable and steel lines. Mr. Aamodt attended Marquette University and the University of Wisconsin, and was associated with several Milwaukee foundries from 1917 to 1932. At that time he joined National Malleable's Chicago works as steel foundry superintendent, later becoming general superintendent. **Roy C. Hobson,** specialty development engineer at the Sharon, Pa. plant, has been transferred to Chicago as assistant manager of industrial sales.

♦ ♦ ♦

**Charles Hoehn Jr.,** who is serving as president of the Northern California Chapter of the AFA, is manager of the Foundry Division, Enterprise Engine & Foundry Co., San Francisco, and manager of its South San Francisco plant. Mr. Hoehn started part-time work at the San Francisco plant of the company at the early age of 11, and upon finishing high school in 1925 he spent two years in the foundry as a journeyman molder. He then studied civil engineering, and from 1930 to 1937 was engaged in various capacities in that field for the state of California. Mr. Hoehn returned to

(*Continued on page* 112)

RICHARD B. KROPF

BERT J. AAMODT

CHARLES HOEHN JR.

1946 begins this month with exceptionally fine prospects for a prosperous new year for the foundry trade. Certainly no industry more richly deserves a full measure of peacetime prosperity than the foundries of America which have contributed so much to winning final and complete victory.

On this, the threshold of the New Year, we voice the hope that increased opportunities may be offered us to be of service to our foundry friends. In the year ahead, as through the past 62 years, we shall devote our full facilities to the single end of making only—

## UNIFORM WOODWARD PIG IRON

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*Independent Since 1883*

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(*Continued from page* 110)

Enterprise in the foundry sales department in 1937 and shortly was made manager of the South San Francisco plant. After three years he returned to the foundry sales department, and in 1942 was appointed assistant to the general manager, and later assistant to the president. Since 1943 he has been manager of the company's Foundry Division, in charge of all plant operations and sales. In addition to these responsibilities he has also been manager of the South San Francisco plant since March, 1944.

♦ ♦ ♦

**J. T. Parsons** has been appointed district manager in the Pittsburgh branch of Peninsular Grinding Wheel Co., Detroit. A native of Pittsburgh and a graduate of Wharton School, University of Pennsylvania, Mr. Parsons has been sales representative for Carnegie-Illinois Steel Corp. in its Cleveland district, for the last ten years. Prior to that he was branch manager of the Youngstown plant of the Borden Co.

♦ ♦ ♦

**Clarence A. Fee** has been named president and general manager of Abrasive Co., Philadelphia, Division of Simonds Saw & Steel Co. He succeeds **J. W. McLean,** who is retiring after 16 years in the presidency and 44 years' association wth Simonds Saw & Steel Co. Mr. Fee joined the Simonds company in its Chicago factory office in 1912. In 1919 he entered the sales department, was made Chicago office manager in 1919, and since 1929 has been Chicago branch manager.

♦ ♦ ♦

**Frank E. Wartgow** has joined the national headquarters of the American Foundrymen's Association in Chicago where he will head up plans for the association's 50th anniversary year in 1946 and later devote his time to coordination of chapter work and programs. Mr. Wartgow, who has been supervisory engineer, Hasbrouck Haynes Engineers, Chicago, for the last year, formerly was associated with American Steel Foundries, Chicago, for eight years in industrial and time study engineering. He has been an active member of the Chicago Chapter of the AFA, recently serving as its vice chairman.

♦ ♦ ♦

**Cleaveland F. Colburn** has been appointed manager of the Roselle Foundry Co., Roselle Park, N. J. Mr. Colburn was formerly metallurgist, Lawrence Engineering & Research Corp., Linden, N. J. Prior to that he was associated with Goulds Pumps Inc., Seneca Falls, N. Y. and Sterling Foundry Co., Wellington, O. Mr. Colburn is a graduate of Rutgers University.

♦ ♦ ♦

**Albert H. Charlton** has been appointed sales manager of the Aluminum Division, Reynolds Metals Co., with headquarters in Louisville. Mr. Charlton joined the company in 1936, at the sheet mills in Louisville, and recently had been eastern sales manager for the Aluminum Division in New York.

♦ ♦ ♦

**E. V. Crane,** for many years associated with the E. W. Bliss Co., Brooklyn, N. Y., has been made vice president of Sam Tour & Co. Inc., New York, in charge of mechanical engineering and metalworking projects and research. Mr. Crane will continue his interests in stamping and work-hardening problems.

♦ ♦ ♦

**Isador Glueck** has retired from Federated Metals Division, American Smelting & Refining Co., New York, after 31-years' service. Mr. Glueck entered the scrap metal industry at the St. Louis plant of a predecessor of Federated Metals Division in 1914. He was placed in charge of the sales and export department of the division's New York office in 1921. Four years later he became manager of its Chicago plant, returning to New York in 1937 as general manager of the eastern division, a position which he has held since that time. He will continue to serve the company in a consulting capacity. Mr. Glueck has been vice president of the Nonferrous Ingot Metal Institute since its inception.

♦ ♦ ♦

**J. M. Laine,** directeur, Centre Technique Des Industries De La Fonderie, Paris, and general secretary of the Association Technique De Fonderie, has been visiting in the United States on a purchasing mission for French foundries. Mr. Laine will go back to France shortly but will return to the United States approximately four weeks later to complete the work of the purchase commission.

♦ ♦ ♦

**Walter E.** and **Harold C. Schott** of Cincinnati have been elected directors of the Cleveland Pneumatic Tool Co., Cleveland, and its subsidiaries. The latter also has been made a vice president. The Schott brothers and their associates recently purchased control of the Cleveland company.

♦ ♦ ♦

**John R. Henkle** and **George Hettinger,** for the past several years with the armed forces, have returned to the sales staff of the Mercury Mfg. Co., Chicago, industrial power truck manufacturer.

♦ ♦ ♦

**Joseph W. Sears,** recently district sales engineer at the Dallas, Tex., plant of Link-Belt Co., Chicago, has been appointed district sales manager with headquarters at 711 Main St., Houston, Tex.

(*Continued on page* 116)

J. T. PARSONS

CLARENCE A. FEE

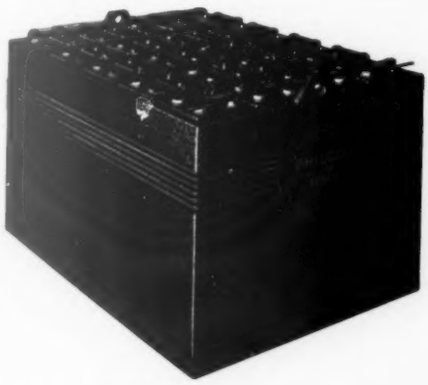
FRANK E. WARTGOW

CLEAVELAND F. COLBURN

ELECTRIC TRUCKS
PALLETIZED LOADS
PHILCO BATTERIES

# Big Three in War and Peace!

Now that wide war-time experience with unit loads has proved battery-powered electric trucks the most flexible, safe, cost-saving equipment for handling materials and finished goods—make this knowledge pay off! Go the whole way by powering your electric trucks with the amazing new Philco "Thirty", the high capacity battery that gives 30% longer life! It will save you money. Write for the new Philco "Thirty" catalog.



**Philco Corporation, Storage Battery Division, Trenton 7, New Jersey**

**PHILCO FOR 50 YEARS A LEADER IN INDUSTRIAL STORAGE BATTERY DEVELOPMENT**

# AIRLESS Wheelabrator CAN REDUCE YOUR Waste LINE

The size of your plant "waste" line directly affects not only the size of your profits but also your ability to complete on a favorable basis.

A frequent contributing factor in swelling expense bulges is inefficient cleaning . . . a condition that nearly 3000 plants have solved with airless Wheelabrators.

This modern cleaning method is extremely fast, economical, and efficient. The Wheelabrator unit throws a storm of more than 280,000 shot or grit per second that no sand or scale can resist.

*Result:* Unusual savings in time, money, manpower, horsepower, and floor space . . . a minimum of breakage . . . products are scoured lustrously clean . . . faster machinability is obtained with less frequent tool grinding . . . simplified work-inspection.

If these are the advantages you want in your own business let us show you in black and white how a Wheelabrator will quickly pay for itself out of the savings it effects.

## PROOF FROM USERS THEMSELVES

Over 80 tons of large, bulky castings are cleaned in eight hours in each of two Wheelabrator Monorail cabinets at Crucible Steel Castings Co., Milwaukee, Wis. . . . One of these is used for cleaning steel castings in the green stage and the other for handling the same pieces after annealing. Each of two 48" x 72" Wheelabrator Tumblasts cleans from 40 to 45 tons of smaller castings in the same time.

★ ★ ★

A gang of six laborers was required to man an airblast room which was operated 24 hours a day seven days a week at Texas Steel Co., Fort Worth, Texas in cleaning steel castings. With the installation of a 48" x 42" Wheelabrator Tumblast, cleaning room labor was reduced to one operator for the airblast room and one for the Wheelabrator Tumblast. Castings are cleaned faster, better and at greatly reduced cost. Only ten minutes are needed to clean 1500 pound loads.

★ ★ ★

With time as valuable as it is today, Alten's Foundry & Machine Works, Lancaster, Ohio is effecting tangible savings with a 66" Wheelabrator Swing Table. This is an example of its high speed cleaning efficiency: whereas peak cleaning production on large cast cement mold drums was 3 or 4 a day by chipping and grinding, ten are now Wheelabrated daily in addition to the tons of other castings that are being cleaned in a fraction of the former time required.

★ ★ ★

A Wheelabrator Monorail Cabinet at General Foundry & Mfg. Co., Flint, Michigan is removing burned-in sand from 18" Meehanite truck brake drums at the rate of 120 to 160 drums per hour. Compare this with the 14 castings cleaned in 50 minutes with their former tumbling mill process.

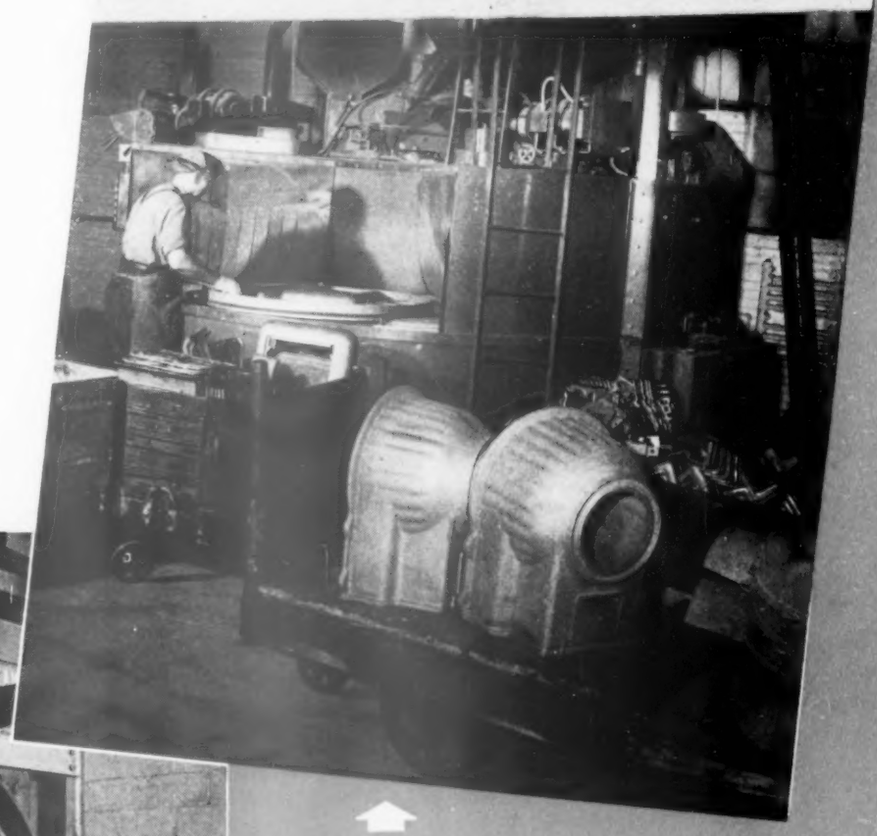
Notice the bright, clean, silvery appearance of the Wheelabrated castings in the conveyor of the 27" x 36" Wheelabrator Tumblast. This load of gray iron castings was cleaned in just four minutes.

THE AMERICAN WHEELABRATOR

**WORLD'S LARGEST BUILDERS OF AIRLESS BLAST EQUIPMENT**

## HOW IT WAS DONE AT GUELPH STOVE COMPANY

Guelph Stove Company, one of the leading Canadian manufacturers of stoves and furnaces, eliminated costly waste in the cleaning room by installing a No. 3 Wheelabrator Table and a 27" x 36" Wheelabrator Tumblast to handle their entire production. In addition to removing sand from castings in the green stage, both machines are used for cleaning preparatory to enameling. (see illustrations below) Twelve tumbling mills were eliminated . . . breakage of fragile stove parts became a thing of the past . . . production capacity was increased, using only a fraction of the former floor space . . . and cleaner working conditions were maintained.



**A one-minute cycle through the No. 3 Wheelabrator Table is sufficient to remove foundry sand from stove plate and furnace castings. Many tons of castings of the type shown in the picture above are cleaned daily in the rough stage and prior to enameling.**

**This 27" x 36" Wheelabrator Tumblast, operating nine hours daily, cleans all of the small stove and furnace parts. Loads weighing several hundreds of pounds each are cleaned in from two to six minutes.**

# American

## FOUNDRY EQUIPMENT CO.

505 S. BYRKIT ST. MISHAWAKA, IND.

THE FOUNDRY IS A GOOD PLACE TO WORK

(*Continued from page* 112)

He has been with the company since 1935 and has been located at Dallas since 1941. Mr. Sears has been succeeded by **Stuart Penick,** who has been associated with various Link-Belt plants and the Dallas and Houston offices during the past ten years.

♦ ♦ ♦

**Lyle C. Beaudoin,** recently released by the Army, has returned to the Chas. Taylor Sons Co., Cincinnati, and will handle the Michigan territory from the Detroit office of that company. Mr. Beaudoin, who left the firm in 1943, saw service with a detachment in North Africa and upon his return to the United States, was re-assigned to the Army Criminal Investigation Department.

♦ ♦ ♦

**V. G. Scott** has been appointed manager of sales, the Wood Shovel & Tool Co., Piqua, O., succeeding the late N. T. Jacobs. Mr. Scott joined the company in 1942 as assistant manager of sales and two years later became production manager, which position he held until his recent appointment. Previous connections include ten years in the sales department of Ames Baldwin Wyoming, Parkersburg, W. Va., and prior to that a period of sales work with the Pittsburgh Shovel Co., Pittsburgh.

♦ ♦ ♦

**R. J. Swing** has been appointed general sales manager of the industrial division of the Monarch Aluminum Mfg. Co., Cleveland. For a number of years Mr. Swing had been territorial manager for the E. F. Houghton Co., Philadelphia.

♦ ♦ ♦

**Charles J. Scullin** has re-entered the foundry consulting business after serving several years with the War Production Board, Washington, where he was associated with the Magnesium Castings Section, Aluminum and Magnesium Division. He will maintain headquarters at 5222 Bancroft Ave., St. Louis. Mr. Scullin served his foundry apprenticeship with the Scullin-Gallagher Steel Co., St. Louis, American Steel Foundries, Chester, Pa., and the Baldwin Locomotive Works, Philadelphia. Later he became manager of technical service for the St. Louis Coke & Iron Co., Granite City, Ill., and subsequently engaged in research and consulting work.

♦ ♦ ♦

**C. Howard Lungren,** sales engineer for Milwaukee Foundry Equipment Co., Milwaukee, for the last ten years, has been

C. HOWARD LUNGREN

made general manager and vice president, to succeed **H. E. Fellows,** who has resigned.

♦ ♦ ♦

**Herbert F. Miller** Jr., until recently superintendent of the foundry division, Central Specialty Co., Ypsilanti, Mich., has been appointed superintendent of the steel foundry, Gunite Foundries, Rockford, Ill.

♦ ♦ ♦

**Donald L. Schwartz,** for the last two years engaged in war research work at the metallurgical laboratory, University of Chicago, has been appointed research metallurgist, Carboloy Co. Inc., Detroit. Mr. Schwartz, a graduate of the University of Michigan, was formerly superintendent of the metallurgical laboratory, Cleveland Graphite Bronze Co., Cleveland.

♦ ♦ ♦

**Ernest G. Jarvis** has been named acting president of Continental Industries Inc., and Continental Services Inc., New York, following the sudden death of **Chester A. Bolles,** former president. Mr. Jarvis, who was appointed chief metallurgist for the company in 1944, is president of Niagara Falls Smelting & Refining Corp., Buffalo, a subsidiary of Continental which he founded in 1923, and in this capacity has been close to the operations of all of the 24 manufacturing units which comprise the parent company.

♦ ♦ ♦

**George D. Turnbull** has been named a director and vice president in charge of operations, and **E. C. Winsborrow,** a director and vice president in charge of sales and research of Shawinigan Foundries Ltd., Shawinigan Falls, Que. Both men formerly were associated with the Canadian Car & Foundry Co. Ltd., Montreal, Que.

♦ ♦ ♦

**F. E. Nifenecker,** directeur-adjoint, Fonderies Automobiles Peugeot, Montbeliard, France, has been visiting in the United States recently. Mr. Nifenecker has purchased equipment to rebuild the Peugeot Fonderies which was wrecked by Allied bombing three days after the Germans took over the operation of the plant.

♦ ♦ ♦

**H. M. Munson** has been appointed manager of the newly-organized industrial instruments division of the Claud S. Gordon Co., Chicago. Until recently

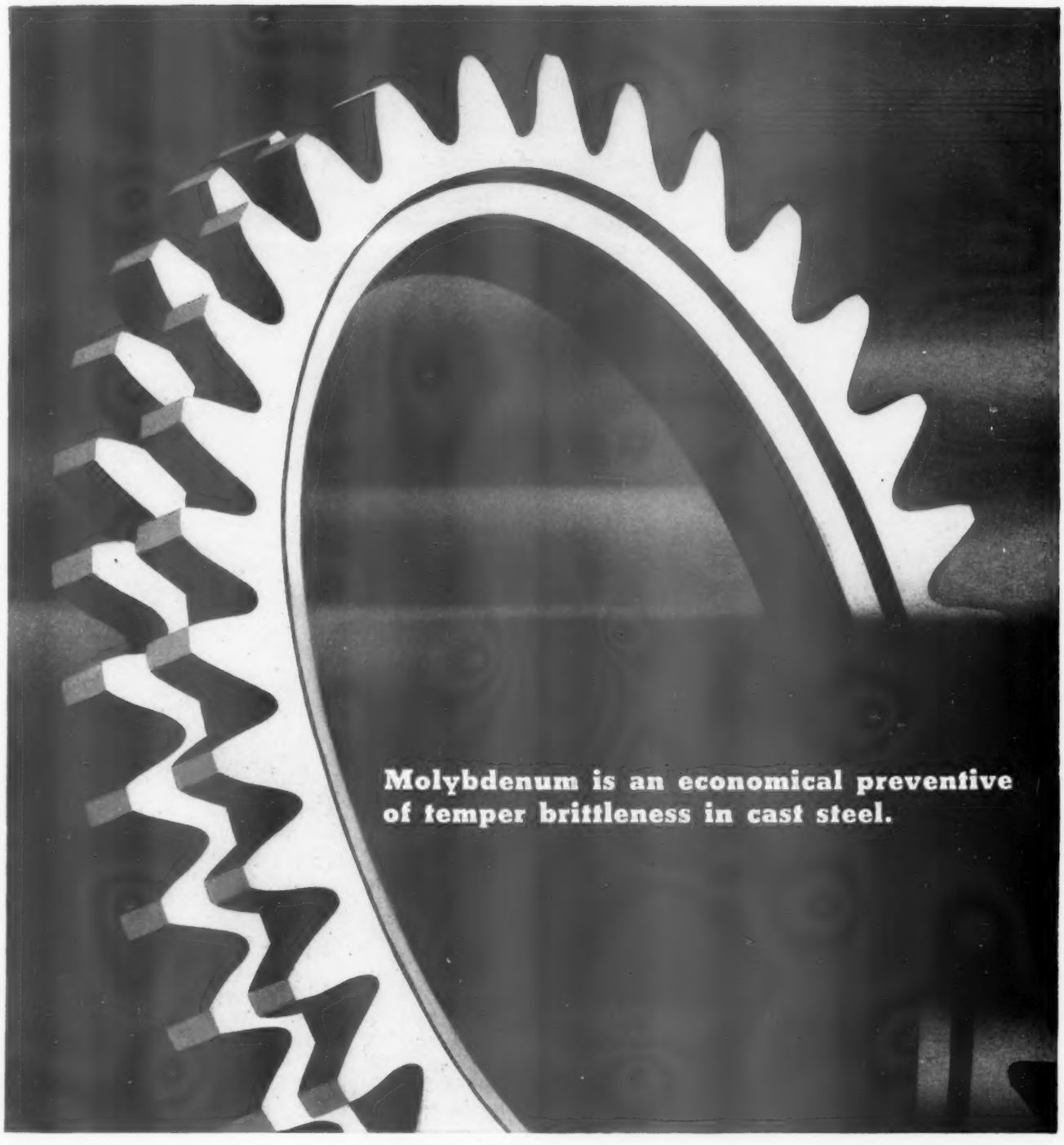
(*Continued on page* 118)

LYLE C. BEAUDOIN

V. G. SCOTT

R. J. SWING

CHARLES J. SCULLIN




CLIMAX FURNISHES AUTHORITATIVE ENGINEERING DATA ON MOLYBDENUM APPLICATIONS.

ARMY E NAVY

MOLYBDIC OXIDE, BRIQUETTED OR CANNED • FERROMOLYBDENUM • "CALCIUM MOLYBDATE"

**Climax Molybdenum Company**

**500 Fifth Avenue · New York City**

MOLY

(*Continued from page* 116)

Mr. Munson was associated with Manning, Maxwell & Moore, Bridgeport, Conn. He will be in charge of applications and sales of indicating and recording thermometers and all types of process control instruments.

♦ ♦ ♦

**Wilson H. Moriarty,** assistant to the president, National Malleable & Steel Castings Co., Cleveland, has been elected vice president in charge of sales. Mr. Moriarty, a graduate of Case School of Applied Science, joined the company in 1920. After a training period he became resident inspector at the Cleveland plant, later holding the same positions in the East St. Louis and Chicago plants. In 1927 he was appointed chief inspector for all plants, sales engineer at the Cleveland plant three years later, and its sales manager in 1939. Since 1943 he has been assistant to the president.

♦ ♦ ♦

**H. E. Fellows** has resigned as general manager, Milwaukee Foundry Equipment Co., Milwaukee, to form his own company for the development of a line of modern molding machines. A 1916 graduate of University of Wisconsin, Mr. Fellows at one time was associated with J. I. Case Co., Racine, Wis., in the experimental department and as a coordinator between engineering and production departments as well as an instructor in that company's service school. Subsequently he became chief draftsman and designer of oil burner fuel pumps at Webster Electric Co., Racine, Wis., and later was general foundry engineer in pattern and rigging design at Samson Tractor Co., Janesville, Wis. While at Milwaukee Foundry Equipment Co., he was subsequently designer, chief engineer, factory manager, sales manager and general manager.

HERBERT F. SCOBIE

*Who has joined the national office staff of the American Foundrymen's Association, as noted in THE FOUNDRY for November*

**M. F. Becker,** formerly vice president, Whiting Corp., Harvey, Ill., has opened an office at 211 West Wacker Drive, Chicago, under the name of M. F. Becker & Associates, to operate as manufacturers representative serving the foundry and other industries. They now represent exclusively in the Chicago area the Alvey-Ferguson Co., Cincinnati, manufacturer of conveying machinery and metal washing machines, but activities will be expanded by addition of other lines of equipment.

♦ ♦ ♦

**William J. Priestly,** since 1944 president of Electro Metallurgical Co., subsidiary of Union Carbide & Carbon Corp., New York, has been elected also a vice president of the latter corporation in charge of the Alloys and Metals Division. He has been associated with Electro Metallurgical Co. since 1923 and from 1932 until 1944 was vice president.

Other newly-elected vice presidents of Union Carbide & Carbon Corp. include **Arthur V. Wilker,** president, National Carbon Co. Inc., and **Robert J. Hoffman,** president, Union Carbide & Carbon Research Laboratories Inc.

♦ ♦ ♦

**James A. Slater,** vice president in charge of railway sales, National Malleable & Steel Castings Co., has retired. Mr. Slater joined the company in 1897 as an office boy, and subsequently held positions as sales agent, railway sales manager and later assistant sales manager, sales manager, assistant vice president and vice president in the Chicago office. He will continue as a director and assistant to the president.

♦ ♦ ♦

**Frank M. Gore,** until recently sales engineer, Commercial Steel Casting Co., Marion, O., has been appointed sales manager, the Akron Bronze & Aluminum Co., Akron, O. Mr. Gore, a graduate of Carnegie Institute of Technology, was superintendent of the Alliance, O., plant of American Steel Foundries for several years. He spent 14 years with the Firestone Tire & Rubber Co., Akron, as pattern superintendent and assistant manager of the mechanical division, and was with Commercial Steel Casting Co. for five years until his recent appointment.

♦ ♦ ♦

**W. J. Gallana** has been appointed manager of alloy sales, E. J. Lavino & Co., Philadelphia. Mr. Gallana has been associated with Rogers Brown-Lavino Co., Philadelphia, since it was founded in 1931, and will retain his present position as vice president of that company.

♦ ♦ ♦

**Laurence H. Hahn,** metallurgist, Sivyer Steel Casting Co., Chicago, has been elected vice president of the Chicago Chapter, American Foundrymen's Asso-

(*Concluded on page* 120)

W. H. MORIARTY

H. E. FELLOWS

M. F. BECKER

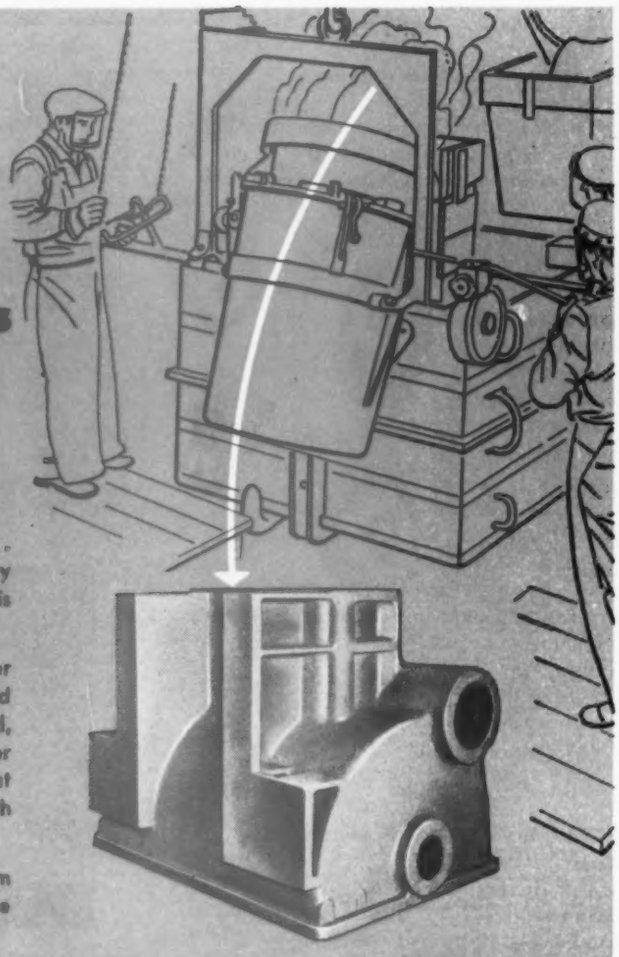
W. J. PRIESTLY

*whenever they're casting*

*magnesium alloys . . .*

**you'll find these savings**

*—in handling—in machining*



Two of magnesium's biggest advantages . . . lightness . . . machinability . . . are doing a daily economy job in many a modern foundry. The metal that makes products light is lightening production costs, too.

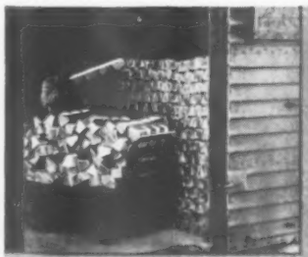
First, in handling, you'll find important savings in manpower and time—savings you get only from magnesium, one-third lighter than aluminum, one-fourth the weight of iron. Second, in machining, you'll see economy that's unmatched by other structural metals. With magnesium you can machine at highest speeds, remove maximum quantities of metal with minimum wear and tear on cutting tools.

Make these economies in your own plant! Turn to magnesium —get in touch with the nearest Dow office for complete engineering service.

*Ready . . . to make products move!*

# MAGNESIUM

LIGHTEST OF ALL STRUCTURAL METALS



Dow is America's principal producer of magnesium, with a full line of casting alloys, fluxes, and also various accessory materials.

Facilities for working magnesium by all common methods are available in Dow's own complete shops and in many independent ones.

Standard procedures have been mapped out for all magnesium work, such as the heat-treating operation shown in this picture.

MAGNESIUM DIVISION • THE DOW CHEMICAL COMPANY, MIDLAND, MICHIGAN

New York • Boston • Philadelphia • Washington • Cleveland • Detroit • Chicago • St. Louis • Houston • San Francisco • Los Angeles • Seattle

(*Concluded from page* 118)

ciation, to succeed Frank E. Wartgow, supervisory engineer, Hasbrouck Haynes Engineers, Chicago, who resigned both posts as of Dec. 1 to become a member of the national office staff of the American Foundrymen's Association, Chicago.

♦ ♦ ♦

**George Liff,** after three and one-half years of overseas duty with the Army Air Forces, has been relieved from active duty and has been elected vice president of Klein-Farris Co. Inc., Boston, in charge of foundry supplies and equipment sales in Connecticut.

♦ ♦ ♦

**Harold W. Lownie Jr.,** formerly an engineer for the Westinghouse Electric Corp., has been appointed to the research staff of Battelle Memorial Institute, Columbus, O., and assigned to its division of foundry metallurgy. Mr. Lownie received his degree in chemical engineering from Purdue University and his master's degree from the University of Pittsburgh.

♦ ♦ ♦

**Earl Beyerlein,** until recently metallurgist, Hansell-Elcock Co., Chicago, has joined Hershey Machine & Foundry Co., Manheim, Pa. Mr. Beyerlein attended Purdue University and was subsequently associated with International Harvester Co., and Koppers Co., Ft. Wayne, Ind., as well as Hamilton Foundry & Machine Co., Hamilton, O.

♦ ♦ ♦

**Charles F. Greene** has been appointed Atlanta representative of the Storage Battery Division, Philco Corp., Trenton, N. J. Mr. Greene attended University of Florida and formerly was connected with A. K. Sutton Inc., Philco distributors in Charlotte, N. C.

♦ ♦ ♦

**John P. Mullen** has resigned as educational director and member of the management committee, Gray Iron Founders' Society. Mr. Mullen joined the Washington office of the society in July, 1943.

♦ ♦ ♦

**Major Maxwell A. Goodwin** has returned from three years' service in the Army to his former position as Chicago division manager, Clark Tructractor Division, Clark Equipment Co.

♦ ♦ ♦

**Robert H. Boyer,** formerly inspector of precision equipment, the Bullard Co., Bridgeport, Conn., has been appointed sales engineer in the brush division of the Osborn Mfg. Co., Cleveland. Mr. Boyer, who attended Sheffield Scientific School of Yale University, has had 33 years of sales executive experience.

♦ ♦ ♦

**Charles T. Evans Jr.,** until recently manager of the carbide department of the Titusville, Pa., plant, University-Cyclops Steel Corp., Bridgeville, Pa., has been appointed chief metallurgist, Elliott Co., Jeannette, Pa.

♦ ♦ ♦

**John D. Wise** has been appointed district sales engineer at Chicago for the Pangborn Corp., Hagerstown, Md., He has been with the company for about ten years and prior to his latest appointment was director of purchases. Following

JOHN D. WISE

service in World War I Mr. Wise joined the Osborn Mfg. Co., Cleveland, subsequently becoming assistant sales manager. He resigned that position in 1933, and for a short time before going with the Pangborn Corp. served as executive secretary of the Foundry Equipment Manufacturers Association.

♦ ♦ ♦

**Dr. Taylor Lyman,** formerly instructor in metallurgy, University of Notre Dame, Columbia University and the Illinos Institute of Technology, has been made editor of the *Metals Handbook,* published by the American Society for Metals.

♦ ♦ ♦

**J. K. Keogh,** associated with Allis-Chalmers Mfg. Co., Milwaukee, since 1904, has been appointed manager of the Pittsburgh district office. Mr. Keogh has been field engineer with the Pittsburgh office since 1919.

♦ ♦ ♦

**Comm. George Gellhorn,** who recently was released to inactive status by the Navy, has returned to Worthington Pump & Machinery Corp. to resume his position as export manager at the Harrison, N. J. works. Before reporting for active Navy duty in 1942, Mr. Gellhorn had spent over 11 years with the company.

♦ ♦ ♦

**F. H. Hoge,** executive vice president, W. A. Jones Foundry & Machine Co., Chicago, has been elected president, succeeding **William Coleman,** who has resigned.

♦ ♦ ♦

**Hugh Avery,** until recently in charge of employment at the Lake Erie Engineering Corp., Buffalo, N. Y., has been appointed personnel director, Robins Conveyors Inc., Passaic, N. J.

♦ ♦ ♦

**Edwin M. Perrin,** advertising manager of Robins Conveyors Inc., Passaic, N. J., since 1942, has been appointed assistant manager of equipment sales.

## Officers Are Elected By AIME

Report of the tellers at a meeting of the board of directors of the American Institute of Mining and Metallurgical Engineers held in New York on Nov. 13 showed the following were elected officers for 1946:

President and director—Louis S. Cates, Phelps Dodge Corp., New York; vice presidents and directors, Holcombe J. Brown, West Newton, Mass., and Erle V. Daveler, American Zinc, Lead & Smelting Co., New York; directors, W. E. Brewster, Wisconsin Steel Works, International Harvester Co., Chicago; A. B. Kinzel, Union Carbide & Carbon Research Laboratories Inc., New York; Philip Kraft, Newmont Mining Co., New York; David D. Moffat, Utah Copper Co., Salt Lake City; Russell B. Paul, New Jersey Zinc Co., New York, and William B. Plank, Lafayette College, Easton, Pa.

## Book Review

*Manpower in Marketing,* edited by Eugene J. Benge, 294 pages, published by Harper & Bros., New York. Price $4.

This book is addressed to executives who realize the necessity for making use of tested and effective methods of selecting, training, equipping and evaluating their sales staff. The vital role of manpower in the new marketing is considered and procedures set forth in practical terms for improving the quality and effectiveness of sales personnel. The progressive sales manager will find in it the helpful guidance he is seeking for the challenge he faces in tomorrow's marketing.

Finishing a large core at Pyott Foundry & Machine Co., Chicago.

Thus the superintendent of Pyott Foundry & Machine Company speaks of Certified Core Oil, which they have used in the Pyott core room for many years. This foundry produces grey iron castings up to several tons each in weight, as well as the well-known line of Pyott gears, pulleys, flywheels, all of which require smooth finish cores.

In a preponderance of foundries with above-average products you will find Certified Core Oil in use, because *it provides these eight important advantages:* (1) proper grain coating; (2) clean working in the boxes; (3) minimum baking time; (4) maximum core strength; (5) easy shake-out; (6) minimized gas and smoke; (7) maximum economy; and (8) thoroughly dependable uniform quality.

Each of the three general types of Certified Core Oil, described at left, is available in several grades of binding strength. Regardless of the metal cast, the sand used or the oven conditions, there is an ideal grade of Certified Core Oil for every requirement.

Certified Core Oils are sold with the distinct understanding that the quality must be as represented, be of strictly uniform quality and give complete satisfaction—or be returned for full credit. Place a trial order on this guarantee.

Tell us the grade and number of the core oil you use, your type and mesh of sand, and your oven conditions. We will prescribe your ideal core oil.

**CERTIFIED GOLDEN CORE OILS**, identified by their color, are made from the most select raw materials. Usually termed "conventional core oils."

**CERTIFIED UNIQUE CORE OILS** give the same results as our Golden Core Oils, but are made from off-colored materials which are dark in color and cost much less.

**CERTIFIED RAPIDRY CORE OILS** are new core oils, also dark in color, and considerably lower in price. They bake quicker in the oven or at a lower temperature and provide more readily collapsible cores.

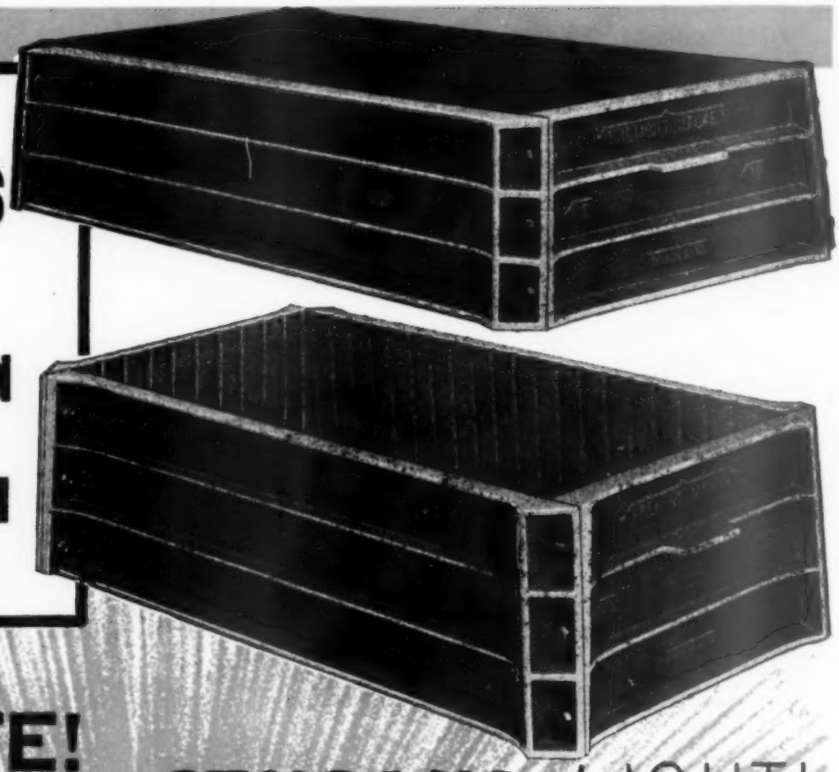
# CERTIFIED CORE OIL & MFG. CO.

*"The House of Dependability"*

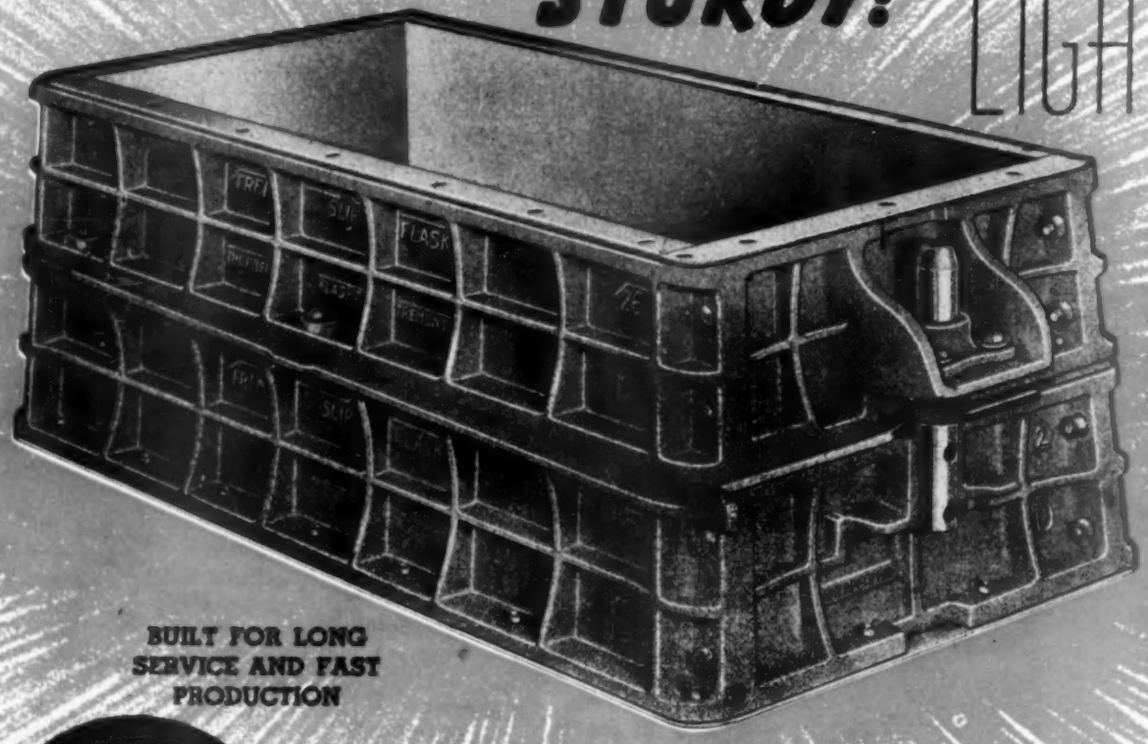
3308-26 South Cicero Avenue, Cicero, Illinois

**Stock and representatives: Buffalo, N. Y.; Elmira, N. Y.; Worcester, Mass.; Bloomfield, N. J.; Reading, Pa.; Sunbury, Ohio; St. Louis, Mo.; Milwaukee, Wisc.; Minneapolis, Minn.; Birmingham, Ala.; Houston, Tex.; Denver, Colo.; San Francisco, Calif.; Portland, Ore.**

**JACKETS**
FURNISHED
IN
**CAST IRON**
OR
**ALUMINUM**



**ACCURATE!** ***STURDY!*** LIGHT!



BUILT FOR LONG SERVICE AND FAST PRODUCTION

**FREMONT MAGNESIUM FLASKS**

GROOVLOCK
THE FOOL-PROOF PIN

**THE FREMONT FLASK CO.**
**Fremont, Ohio**

# Foundry Statistics

## Malleable Iron Castings

| | Production (Tons) | | | New Net Orders (Tons) | | |
|---|---|---|---|---|---|---|
| | 1945 | 1944 | 1943 | 1945 | 1944 | 1943 |
| Jan. | 83,742 | 75,594 | 63,572 | 97,153 | 93,855 | 73,524 |
| Feb. | 78,385 | 74,812 | 66,401 | 79,913 | 79,352 | 87,728 |
| Mar. | 86,175 | 81,480 | 78,143 | 98,979 | 90,038 | 85,744 |
| Apr. | 77,042 | 69,820 | 72,359 | 78,075 | 88,169 | 74,241 |
| May | 83,013 | 70,555 | 69,959 | 83,421 | 92,285 | 77,768 |
| June | 71,783 | 70,993 | 69,111 | 35,603 | 103,692 | 78,289 |
| July | 53,805 | 61,320 | 66,011 | 58,589 | 406,626 | 91,653 |
| Aug. | 54,026 | 74,297 | 67,615 | —13,029 | 71,307 | 108,505 |
| Sept. | 52,217 | 74,628 | 74,874 | 30,740 | 49,502 | 99,911 |
| Oct. | ..... | 80,505 | 74,254 | ..... | 76,536 | 101,510 |
| Nov. | ..... | 79,629 | 72,077 | ..... | 48,149 | 93,370 |
| Dec. | ..... | 76,187 | 75,188 | ..... | 69,972 | 81,978 |
| Total | ..... | 889,820 | 849,764 | ..... | 969,483 | 1,064,224 |

## Steel Castings

| | Shipments (Tons) | | Production (Tons) | | New Net Orders (Tons) | |
|---|---|---|---|---|---|---|
| | 1945 | 1944 | 1945 | 1944 | 1945 | 1944 |
| Jan. | 201,162 | 237,570 | 157,176 | 159,795 | 210,182 | 167,739 |
| Feb. | 186,364 | 211,958 | 146,165 | 161,359 | 214,408 | 173,592 |
| Mar. | 211,890 | 224,913 | 166,896 | 174,626 | 203,170 | 162,575 |
| Apr. | 190,186 | 204,279 | 150,281 | 155,778 | 177,707 | 175,053 |
| May | 186,376 | 210,360 | 145,092 | 161,783 | 89,790 | 176,993 |
| June | 167,140 | 200,237 | 125,126 | 157,444 | 130,152 | 181,816 |
| July | 133,601 | 176,735 | 99,606 | 131,940 | 110,681 | 169,921 |
| Aug. | 123,835 | 204,833 | 96,151 | 154,911 | 68 286 | 171,309 |
| Sept. | 110,631 | 189,443 | 82,444 | 144,458 | 89,697 | 129,847 |
| Oct. | ..... | 197,772 | ..... | 150,719 | ..... | 146,116 |
| Nov. | ..... | 196,475 | ..... | 146,411 | ..... | 120,667 |
| Dec. | ..... | 190,846 | ..... | 144,162 | ..... | 138,666 |
| Total | ..... | 2,435,421 | ..... | 1,843,386 | ..... | 1,914,294 |

Note: Shipments for sale and own use; production and orders for sale only.

## Aluminum Casting Shipments

(In millions of pounds)

| | Total | Sand | Perm. Mold | Die |
|---|---|---|---|---|
| 1943 | 459.5 | 304.2 | 89.6 | 65.7 |
| June | 36.3 | 24.1 | 6.9 | 5.3 |
| July | 37.2 | 24.7 | 7.1 | 5.4 |
| Aug. | 38.2 | 25.4 | 7.2 | 5.6 |
| Sept. | 40.8 | 27.2 | 7.9 | 5.7 |
| Oct. | 42.7 | 28.5 | 8.0 | 6.2 |
| Nov. | 43.0 | 28.5 | 8.3 | 6.2 |
| Dec. | 41.4 | 27.3 | 8.1 | 6.0 |
| 1944 | 514.5 | 321.1 | 106.3 | 84.2 |
| Jan. | 44.1 | 29.4 | 8.3 | 6.4 |
| Feb. | 45.9 | 30.2 | 8.0 | 7.5 |
| Mar. | 49.5 | 31.4 | 9.6 | 8.1 |
| Apr. | 42.9 | 27.0 | 8.3 | 7.3 |
| May | 44.7 | 27.9 | 8.9 | 7.5 |
| June | 42.4 | 25.9 | 8.8 | 7.4 |
| July | 38.7 | 24.5 | 7.7 | 6.2 |
| Aug. | 43.2 | 26.9 | 9.2 | 6.9 |
| Sept. | 41.5 | 25.5 | 8.9 | 6.9 |
| Oct. | 42.1 | 25.1 | 9.8 | 7.0 |
| Nov. | 40.5 | 24.3 | 9.6 | 6.4 |
| Dec. | 39.0 | 23.0 | 9.2 | 6.6 |
| 1945 | | | | |
| Jan. | 43.5 | 25.3 | 10.6 | 7.3 |
| Feb. | 42.0 | 24.9 | 9.7 | 7.2 |
| Mar. | 48.2 | 27.7 | 12.2 | 8.1 |
| Apr. | 43.8 | 24.8 | 11.1 | 7.7 |
| May | 41.4 | 22.7 | 10.9 | 7.6 |
| June | 37.3 | 19.5 | 10.1 | 7.4 |
| July | 29.0 | 14.0 | 8.7 | 6.3 |
| Aug. | 20.5 | 9.6 | 6.2 | 4.5 |

## Foundry Equipment, Supplies

(In thousands of dollars)

| | Shipments | Orders | Back-logs |
|---|---|---|---|
| 1943 | 53,806 | 32,094 | ..... |
| May | 4,718 | 1,774 | 10,513 |
| June | 4,825 | 2,319 | 9,017 |
| July | 4,017 | 2,405 | 8,345 |
| Aug. | 3,513 | 1,989 | 7,429 |
| Sept. | 3,881 | 2,070 | 6,930 |
| Oct. | 3,792 | 3,401 | 7,092 |
| Nov. | 3,563 | 3,422 | 7,076 |
| Dec. | 3,217 | 3,786 | 7,731 |
| 1944 | 41,914 | 44,903 | ..... |
| Jan. | 3,336 | 3,515 | 7,910 |
| Feb. | 3,426 | 4,338 | 8,822 |
| Mar. | 3,679 | 4,370 | 9,513 |
| Apr. | 3,496 | 2,424 | 8,441 |
| May | 3,547 | 4,089 | 8,983 |
| June | 3,554 | 3,906 | 9,335 |
| July | 3,027 | 3,086 | 9,394 |
| Aug. | 3,818 | 4,115 | 9,691 |
| Sept. | 3,445 | 3,465 | 9,711 |
| Oct. | 3,758 | 4,293 | 10,246 |
| Nov. | 3,451 | 3,401 | 10,196 |
| Dec. | 3,377 | 3,912 | 10,731 |
| 1945 | | | |
| Jan. | 3,355 | 3,631 | 11,007 |
| Feb. | 3,548 | 4,103 | 11,562 |
| Mar. | 3,804 | 5,247 | 13,005 |
| Apr. | 3,685 | 2,678 | 11,997 |
| May | 3,741 | 3,778 | 12,034 |
| June | 3,724 | 3,399 | 11,709 |

## Magnesium Casting Shipments

(In thousands of pounds)

| | Total | Sand | Perm. Mold | Die |
|---|---|---|---|---|
| 1943 | 65,967 | 59,123 | 3,978 | 2,866 |
| June | 4,690 | 4,159 | 296 | 235 |
| July | 4,940 | 4,406 | 290 | 244 |
| Aug. | 5,238 | 4,770 | 257 | 211 |
| Sept. | 6,008 | 5,391 | 390 | 227 |
| Oct. | 6,774 | 6,096 | 431 | 247 |
| Nov. | 6,792 | 6,068 | 452 | 272 |
| Dec. | 6,840 | 6,220 | 382 | 238 |
| 1944 | 83,979 | 75,221 | 6,396 | 2,362 |
| Jan. | 6,984 | 6,210 | 536 | 238 |
| Feb. | 7,293 | 6,603 | 469 | 221 |
| Mar. | 8,242 | 7,574 | 496 | 172 |
| Apr. | 7,520 | 6,922 | 413 | 185 |
| May | 7,357 | 6,664 | 514 | 179 |
| June | 6,535 | 5,729 | 598 | 208 |
| July | 6,481 | 5,653 | 656 | 172 |
| Aug. | 6,934 | 6,143 | 563 | 228 |
| Sept. | 6,945 | 6,147 | 606 | 192 |
| Oct. | 6,738 | 6,062 | 515 | 161 |
| Nov. | 6,639 | 5,919 | 521 | 199 |
| Dec. | 6,315 | 5,595 | 509 | 207 |
| 1945 | | | | |
| Jan. | 7,005 | 6,149 | 609 | 247 |
| Feb. | 6,707 | 5,832 | 658 | 217 |
| Mar. | 7,664 | 6,700 | 683 | 281 |
| Apr. | 7,053 | 6,257 | 614 | 182 |
| May | 6,794 | 6,081 | 525 | 188 |
| June | 5,521 | 4,878 | 429 | 214 |
| July | 4,427 | 3,961 | 266 | 200 |
| Aug. | 2,061 | 1,820 | 137 | 104 |

## GRAY IRON CASTINGS—Production, Shipments and Unfilled Orders in Tons

| 1944 | Production | Shipments | Unfilled Orders |
|---|---|---|---|
| April | 765,784 | 757,880 | 2,159,280 |
| May | 789,007 | 790,674 | 2,204,572 |
| June | 765,581 | 763,459 | 2,213,183 |
| July | 698,418 | 689,744 | 2,318,645 |
| Aug. | 778,388 | 778,205 | 2,335,194 |
| Sept. | 768,661 | 744,954 | 2,304,323 |
| Oct. | 788,196 | 780,453 | 2,296,690 |
| Nov. | 769,734 | 760,383 | 2,300,350 |
| Dec. | 743,710 | 741,534 | 2,474,548 |
| Totals | 9,275,017 | 9,165,726 | ..... |
| 1945 | | | |
| Jan. | 807,130 | 791,395 | 2,496,928 |
| Feb. | 752,935 | 752,266 | 2,562,076 |
| Mar. | 850,653 | 857,616 | 2,713,656 |
| Apr. | 768,588 | 773,988 | 2,640,642 |
| May | 806,297 | 798,055 | 2,602,986 |
| June | 772,761 | 781,935 | 2,596,012 |
| July | 693,257 | 689,711 | 2,564,973 |
| Aug. | 674,572 | 682,826 | 2,374,578 |
| Sept. | 665,516 | 661,738 | 2,324,620 |

By Type—Latest Months Reported

| | Production | Shipments Total | Shipments For Sale | Unfilled Orders Total | Unfilled Orders For Sale | Unfilled Orders For Own Use |
|---|---|---|---|---|---|---|
| September, 1945 | | | | | | |
| Total | 663,516 | 661,738 | 392,742 | 2,324,620 | 1,579,146 | 745,474 |
| Pressure pipe, fittings | 54,989 | 54,959 | 52,192 | 198,083 | 193,296 | 4,787 |
| Soil pipe, fittings | 15,890 | 16,057 | 16,057 | 195,145 | 195,145 | ..... |
| Chilled car wheels | 64,420 | 58,475 | 51,783 | 175,566 | 162,520 | 13,046 |
| Molds for steel ingots | 138,112 | 143,786 | 68,096 | 218,973 | 107,195 | 111,778 |
| All other gray iron | 392,105 | 388,461 | 204,614 | 1,536,853 | 920,990 | 615,863 |
| August, 1945 | | | | | | |
| Total | 674,572 | 682,826 | 416,947 | 2,374,578 | 1,629,614 | 744,964 |
| Pressure pipe, fittings | 50,825 | 50,264 | 47,642 | 187,098 | 182,192 | 4,906 |
| Soil pipe, fittings | 15,293 | 15,191 | 15,191 | 185,681 | 185,681 | ..... |
| Chilled car wheels | 74,022 | 76,364 | 69,735 | 194,685 | 178,166 | 16,519 |
| Molds for steel ingots | 132,851 | 139,996 | 64,720 | 242,030 | 122,681 | 119,349 |
| All other gray iron | 401,581 | 401,011 | 219,659 | 1,565,084 | 960,894 | 604,190 |

WPB figures reported by Bureau of the Census

# Around DETROIT

BY A. H. ALLEN
Detroit Editor, The Foundry

*Ford's foundry expansion and modernization program involves $10 million. . . . Chevrolet gives go-ahead on enlargement plans, involving six new cupolas, for gray iron foundry*

CONTINUING program of expansion and modernization is going forward in the Ford gray iron production foundry at the Rouge plant, estimates indicating projects now under way and planned for early start cover something like $10 million. Principal elements of the program include: Enlargement of five corerooms and building a large new coreroom in space formerly occupied by a magnesium foundry; rebuilding of four pouring systems for cylinder blocks; installations for more efficient handling of hot metal, along with new cupola charging equipment; erection of new dust collector systems, both on cupolas and in the foundry itself; and the adaptation of bulk material handling systems.

The foundry currently has capacity for 2000 tons of molten metal daily, on two shifts, and from the start has been planned to include conveyor systems to take the molds to the metal rather than to move the metal to the molds. This basic design is being steadily refined to eliminate delays and minimize manual effort.

At one point, however, there has been a temporary reversal, or at least suspension of this trend—at the automatic pouring station where flywheel and transmission cases are cast. This setup was arranged to index molds automatically under a sort of pouring spider into which metal from a holding furnace was poured continuously. With this arrangement, it was necessary for every mold to be in perfect condition and for a mold to be in position with every indexing of the pouring mechanism. Further, it was found necessary to increase the volume of gates and risers to insure sound castings, making for a somewhat higher percentage of return scrap. This, plus the fact that occasionally a bad mold would get by to the pouring point, or because of some hitch there would be no mold in position to receive hot metal, resulting in a spill, set Ford foundry engineers to wondering whether a return to hand pouring of these molds, even though it would involve more manpower, might more than offset the cost of bad molds, spills, etc., and at the same time reduce the amount of metal which had to be melted as against the weight of finished castings. No final decision has been reached on the matter, but the automatic system has been suspended for the time being.

Four cylinder block systems eventually will have capacity for 5500 blocks daily, and it is the intention to concentrate on high-production jobs only, moving out low-run jobs to permit maximum use of facilities. At present, there are five different blocks being produced on these lines, which feature electric pouring cars traveling along with the conveyor line. Ford car, truck and tractor models require a number of different blocks, of course, including the V-8, a 6-cylinder, a 4-cylinder for the tractor, possibly a 5-cylinder sometime in the near future, etc. To handle all these on four production lines does not make for the most efficient operation, so some of them probably will be transferred to outside producers to enable the Rouge to concentrate on heavy runs like the Ford V-8 and the tractor blocks.

### More Than Two Miles Long

The rebuilt block lines will be handling ultimately about 750 tons of molten iron every day, on two 8-hour shifts, and it is estimated that when filled the four systems will involve a line of cylinder blocks more than 2 miles long. Obviously this will take a tremendous amount of molding and core sand. Assuming one mold requires about 600 lb of sand, then 5500 molds a day would require handling and mixing of 3,300,000 lb of sand in the same period.

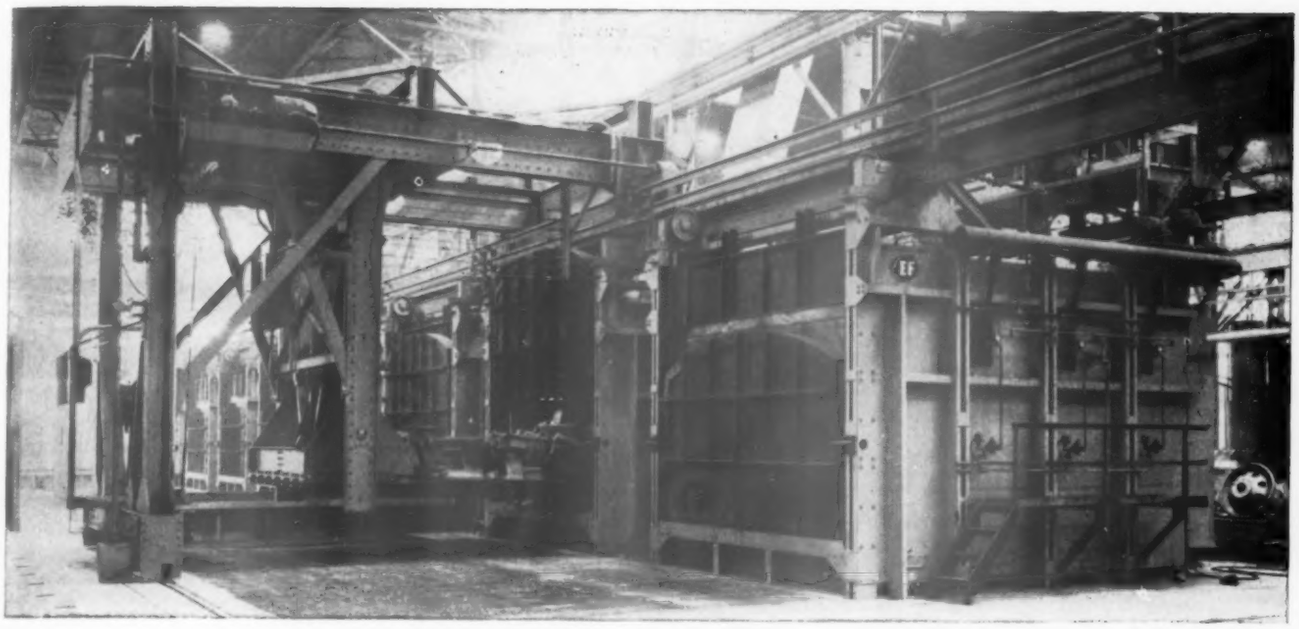
A new sand reclamation system has been projected for the foundry which will permit reuse of a large part of the 55,000 tons of sand required every month at peak operation. Some rearrangement of the sand distribution system has been engineered to eliminate trucking of sand to points not reached by conveyor belts.

New equipment is being installed in five corerooms, as well as in the new coreroom. It includes speed mullers, automatic mixing equipment and other devices to make the preparation of sand mixes more rapid and precise. Ovens going into the new corerooms are of the horizontal type.

Cereal binders, clay, silica flour, bentonite and similar powdered materials, used at a rate of some 6,000,000 lb per month, eventually will be handled by pipeline systems which will force the material either by vacuum or pressure to storage tanks above the spots where they are required. The Ford construction department is now in process of laying out

(*Concluded on page* 126)

**GETTING THE DETAILS: William Day, chief metallurgist of Mack Trucks Inc., explains the function of a wear-test machine to a group of attendants at Mack's first sales institute since the war started, at the company's New Brunswick, N. J., plant. The sessions eventually will be attended by 300 to 400 selected sales representatives**



An installation of EF gas-fired furnaces with quench and gantry crane for various annealing, normalizing and heat treating cycles on large castings.

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Castings, uniformly annealed and absolutely free from scale are discharged continuously from the two EF special atmosphere furnaces shown below.

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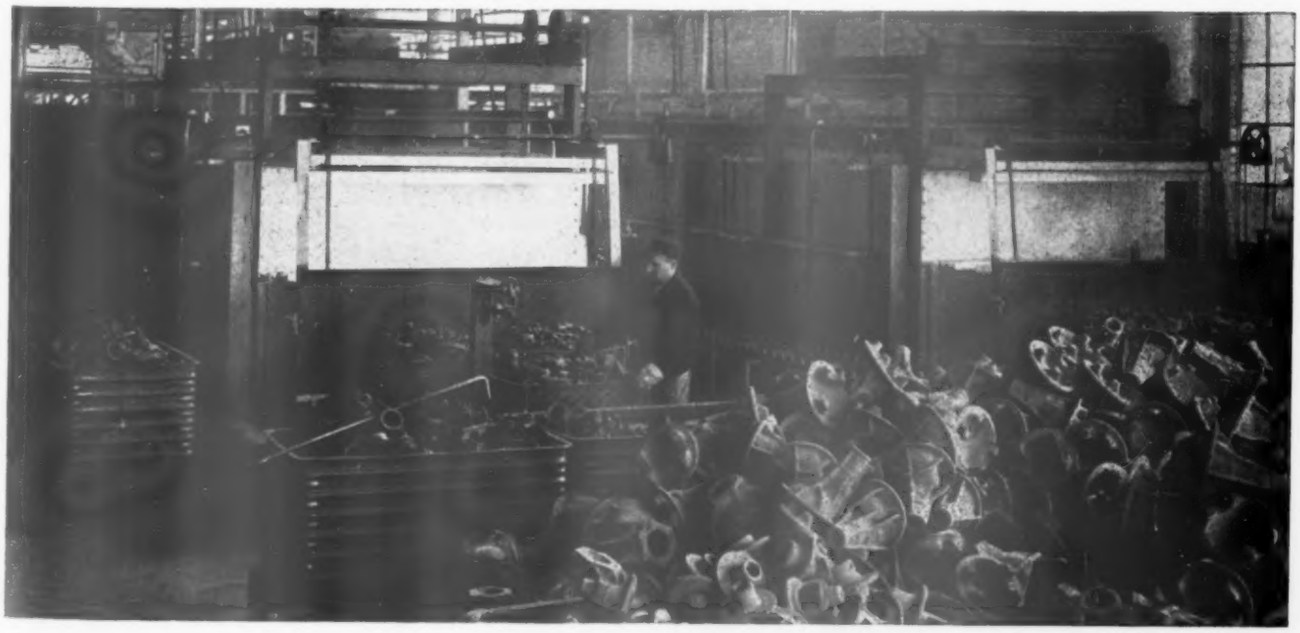

(*Concluded from page* 124)

such systems, none of which is yet in operation.

Some changes are being made in the valve casting department, the principal one being a switch from batch melting to continuous melting with holding furnaces—the practice in other foundry departments.

Further improvements of a more minor nature include a new layout for grinding and chipping blocks, a new cylinder block shot blast cleaning system, new cylinder block welding department, alterations to the small parts cleaning room, rearrangement of two casting lines for cylinder heads, rebuilding of crankshaft core ovens, additional oxygen gas distribution lines, and enlargement and consolidation of the heat treating department. It is understood two new cupolas also are contemplated, as well as a possible system for continuous charging of cupolas.

Deliveries on new cupolas now are reported as running in excess of five months, with one case reported where 11 months was indicated. Much of the delay is occasioned by difficulties in getting delivery on motors and blowers. Cranes are equally deferred, quotations running around six or seven months. Builders with order books jammed on this type of equipment are wondering whether they possibly may have oversold their position, because of the unsettled outlook on costs, particularly labor rates.

Accelerated demand for passenger car brake drums has led to resumption of production activity in foundries of Budd Wheel Co. and Kelsey-Hayes Wheel Co. The latter company, it is understood, plans to reopen its foundry in the old location, although full details of the production layout have not yet jelled. Two cupolas are still standing but have long been inoperative, and practically all other equipment has been removed.

Extensive expansion program at the Chevrolet gray iron foundry division in Saginaw, involving six new cupolas and related equipment, finally has been released, with deliveries scheduled for next June. This project has been in the planning stage for a couple of years, but rested on the shelf until a few weeks ago. Indications are that the facilities will not be in production until 1947 models are under way.

D. W. Bay, vice president of Aluminum Alloys Corp. here, says he finds many manufacturers, confronted with a shortage of gray iron castings, are switching to aluminum castings, for which ample production capacity seems available. In recent weeks he reports his company has received inquiries for a number of parts, formerly made in iron and now being respecified in aluminum. They include pump and air compressor bodies, electric meters, manifolds, cylinder heads, brake shoes and transmission housings.

In excavating for foundations of an expanded and reoriented gray iron foundry department, construction crews at Cadillac Motor Division unearthed some old car wheel pits operated by the Peninsular Wheel Co. approximately 50 years ago and long since interred. The news brought a nostalgic tear to the eyes of many an old-time foundryman here, some of whom served their apprenticeships at the wheel foundry and lived to see it swarmed under by the sprawling automotive plants.

# STEEL FOUNDERS MEET

## In 43rd Fall Session

MORE than 200 steel foundrymen attended the 43rd fall meeting of the Steel Founders' Society of America at Hotel Claridge, Atlantic City, N. J., Nov. 19-20. The two-day program was concerned principally with problems incident to the industry's return to peacetime operations.

The first general session was opened by reports of officers, including Col. Merrill G. Baker, executive vice president, and Keith Williams, treasurer of the society. These were followed by talks by three men who had been selected by the government to survey various phases of steel castings production in Germany. R. A. Gezelius, chief metallurgist, General Steel Castings Corp., Eddystone, Pa., described steelmaking procedures as practiced by Germany during the war, while Dr. J. T. MacKenzie, chief metallurgist, American Cast Iron Pipe Co., Birmingham, explained the German use of the centrifugal casting process. C. W. Briggs, technical and research director of the society, discussed his visits to more than half of the foundries in Germany.

Dr. Lewis H. Haney, New York University, New York, was the speaker at the first day's luncheon session, his subject being "What's Ahead for Business?" Following his address, President A. M. Andorn presented the individuals who had been awarded the society's medals and citations for 1944 at the annual business meeting at Chicago last May 18. These included C. L. Harrell, vice president, Sterling Steel Casting Co., East St. Louis, Ill.; E. A. Walcher, vice president, the Ohio Steel Foundry Co., Lima, O., and Oliver E. Mount, vice president and secretary, American Steel Foundries, Chicago.

A report on a survey being conducted by the society on steel foundry capacity was given by R. L. Collier, executive secretary. This survey, intended to determine the probable extent of postwar demand for steel castings, is expected to be completed shortly. J. E. Mullen, vice president, National Erie Corp., Erie, Pa., and chairman of the society's Advertising Committee, described a proposed advertising program for 1946, and Oliver E. Mount, chairman of the society's Job Evaluation Information Committee, discussed this group's educational program. I. R. Wagner, president, Electric Steel Casting Co., Indianapolis, and chairman of the society's Postwar Committee, presided at a symposium on postwar plans and policies.

The industry luncheon on the second day was addressed by Dr. Leo Wolman, Columbia University, New York, on "Outlook for Business and Labor," following which Charles J. Symington, chairman, Symington-Gould Corp., New York, gave some observations on the Management-Labor Conference in Washington.

## Association Issues Booklet Series

National Founders Association, Chicago, has issued a booklet, the first of a series, to encourage management of foundries and metalworking plants to lay hold of the tremendous possibilities of a new day in industry as applied to their own personal status, the industry of which they are a part, the plants and equipment for which they are responsible, the products with which they are concerned, the men and women who look to them for leadership and the prestige of the community which harbors operations.

Definitely eulogistic and optimistic, the subject matter is presented under the following heads: Looking Ahead; A Good Employer; Good Supervisors; Good Surroundings; Good Equipment; Good Earnings; Good Opportunities; Good Leadership; Still Looking Ahead. The booklet, "The Man and the Mold," is available at 10 cents per copy, $8 in quantities of 100 or more, from the association, 120 South La Salle Street, Chicago 3.

*For Bigger Tonnage*

# MODERNIZE YOUR PRODUCTION LINE

These three foundry views suggest the efficiency obtainable with an up-to-date continuous molding unit.

1. High-speed molding with a double-line battery of squeezer machines. Note wide core aisle.

2. Centralized pouring showing a moving pouring platform.

3. Molds travel through a ventilated cooling tunnel to a vibrating shake-out machine, also ventilated. Shake-out method illustrated is one of the simpler types.

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# *foundry* DEVELOPMENTS

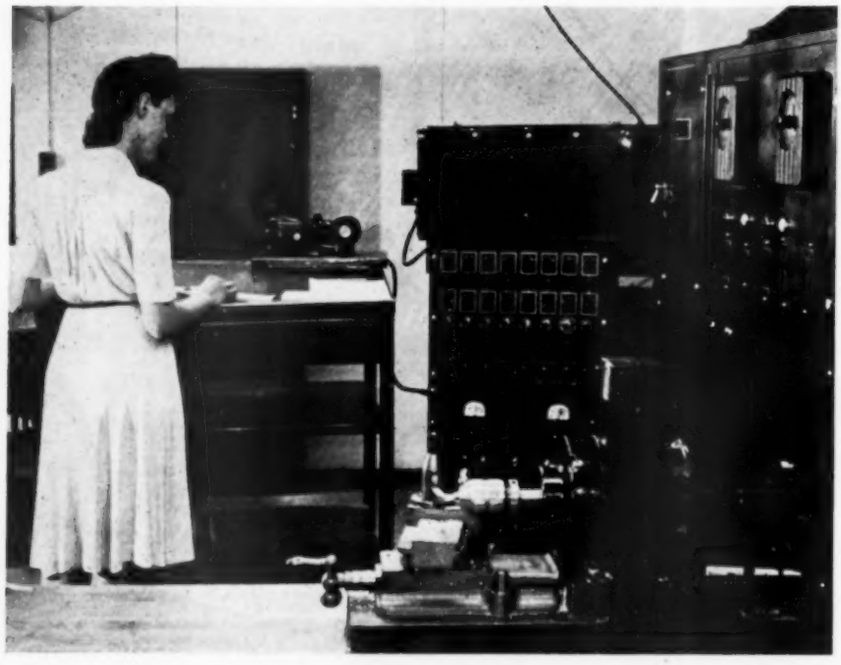
BUREAU of Mines, Department of the Interior, Washington 25, has made available Report of Investigations 3816 on "Effects of Boron in Steel," by R. B. Corbett and A. J. Williams which gives the results of a study of 119 steels to which 16 boron-bearing addition agents were added in various amounts. The authors advance a number of conclusions of which the following are pertinent: Boron should be regarded just as any other element added to steel to increase the hardenability, and its use should not be expected to be a "cure-all" for improper steelmaking practice. Minute amounts of boron will increase the hardenability of steel comparable to that produced by much larger additions of other more common alloying elements. It should not be construed . . . that the use of boron will eliminate the usefulness of the more common alloying elements, as the increase in hardenability due to addition of boron is limited; furthermore, properties other than hardenability must of necessity be supplied as formerly by elements other than boron. Generally boron is most valuable in medium-carbon steels because high-carbon steels have sufficient innate hardenability, whereas low-carbon steels are not intended to be hardened by quenching. Boron steel should receive a heat treatment consisting of a liquid quench followed by a low-temperature draw in order to obtain the maximum effects of the boron addition.

• • •

AMERICAN Society for Testing Materials, Philadelphia, recently announced that it is changing its terminology in connection with its specifications. The term "standard" will apply, as in the past, to those specifications which after suitable trial have been adopted formally by the society, while the term "tentative" will designate those specifications and test methods which still are undergoing trial, study and consideration. Formerly the latter were known as "tentative standards," and the elimination of the word "standard" should prevent any possible confusion. Policy and procedure relative to specifications will not be changed.

• • •

DIRECT-READING spectrometer developed by J. L. Saunderson and co-workers at Dow Chemical Co., Midland, Mich., has been in use in the firm's magnesium alloying plant for several months permitting analyses to be made in 40 seconds. Substitution of an electronic method of measuring the intensity of spectrum lines eliminates photographic and developing equipment and microphotometer, and avoids errors encountered due to film variations. It is claimed that girl operators can be trained in a single day to use the instrument efficiently. Entire operation is fully automatic from the time metal samples are placed in the instrument shown in the accompanying illustration, until the analysis is recorded on paper. Up to 14 elements can be determined simultaneously. Accuracy is claimed equal or superior to that possible by spectrographic methods.



Direct-reading spectrometer employed to speed analysis of magnesium alloys

• • •

IN AN article on "Application of the Vacuum-fusion Method to the Determination of Oxygen, Hydrogen, and Nitrogen Contents of Nonferrous Metals, Alloys and Powders" published in the July issue of the *Journal* of the Institute of Metals (Great Britain), H. A. Sloman states the aluminum alloys do not contain appreciable amounts of oxide or nitride, but hydrogen is the significant impurity. By vacuum fusion it is possible to determine whether unsound metal is due to gas or shrinkage porosity. Measurement of the void volume and the volume of hydrogen given off shows that the latter is considerably greater than would be required to fill the voids at normal temperature-pressure conditions. Since it is unlikely that the hydrogen would be held under considerable pressure in the voids, it must be assumed that the pressure is one atmosphere. Under that condition it was found that the excess of hydrogen was almost constant, and might be assumed to be in solid solution. Data from these tests strengthen the case for accepting the approximate value of solid solubility of hydrogen in aluminum as 0.5 mm in 100 g.

• • •

FOR pasting cores and sealing the joints of core assemblies the following mixtures developed by the Naval Research Laboratory have been found to give excellent results. Core paste is composed of 3 per cent western bentonite, 6 per cent dextrine and 91 per cent silica flour (200 mesh or finer). Sufficient water is added to form a thin putty. Joint sealing mixture is composed of 3 per cent bentonite, 3 per cent dextrine and 94 per cent silica flour with sufficient water to form a thick putty. To obtain the best results it is essential to mix thoroughly the ingredients in both mixtures in the dry state, and again thoroughly after the water is added. E.B.

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At Hansford, West Virginia, near Charleston on the Kanawha River, stands our Crown Hill Plant. Here Federal carefully processes a superior coal into a superior seacoal facing, the high-volatile, quick-flash CROWN HILL. To this plant, many foundrymen trace their improved operations and cleaner castings; from this plant comes the quality seacoal facing that makes such improvements possible: CROWN HILL QUALITY SEACOAL. It is quick-venting, extremely low in sulphur, and its insignificant ash residue won't fuse under 2,780° F., a factor that assures cleaner castings.

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# FRENCH FOUNDERS

## HOLD FIRST CONVENTION

## IN SIX YEARS

By VINCENT DELPORT
*European Manager*
THE FOUNDRY

AFTER an interval of six years, filled by the sufferings and tribulations of the people of France throughout the war, the Association Technique de Fonderie held its first postwar convention in its own premises at 66, rue Boissiere, Paris, Oct. 19-20. Founders from all the industrial districts of France did not conceal their joy at being able once again to meet freely and in the open, and the proceedings were shadowed only by the thought of those who had disappeared, some in tragic circumstances, others in offering their life for their country.

The occasion was marked by the presence of representatives of foreign associations: Rene Depiez, president of the Belgian association, supported by J. Leonard, past president, G. Halbart, secretary, L. Foulon, treasurer, and other members; Vincent Faulkner, past president of the Institute of British Foundrymen; and Vincent Delport, European manager of THE FOUNDRY and European representative of the American Foundrymen's Association.

### Association Maintained Activities

The proceedings were opened the morning of Oct. 19, by Prof. P. Chevenard, president of the French association. Inspector General Mercier of the Technical Education department of the ministry of Education represented the government. The president of the Syndicat General des Fondeurs de France and other notables of the foundry world were also present.

In his opening address, Professor Chevenard recalled how the Association Technique de Fonderie had succeeded in maintaining activities throughout the war, despite the difficult and perplexing conditions brought about by the enemy occupation. This had proved the continued vitality of the association, and this first meeting, held relatively soon after the liberation of the country, was

VINCENT DELPORT

a good augury for the future. The president thanked those representatives of friendly nations who had overcome traveling difficulties to attend the convention.

The president then asked Professor Portevin, honorary president of the association, director of the French School of Foundry and professor at Ecole Centrale des Arts et Manufactures, to deliver the inaugural address.

Professor Portevin had chosen as his subject "Scientific Research in the Foundry Industry." Emphasizing the importance of scientific research, he mentioned that American industry spends $300,000,000 annually for research and employs over 70,000 people in some 2200 laboratories. He considered research in the foundry industry from three aspects: (1) Control and testing laboratory; (2) Adjusting of methods and operations; (3) Acquisition of essential knowledge and principles necessary to do fundamental research on specific problems. It is on the third aspect that Professor Portevin dwelt more particularly.

He pointed out that there is no definite line of demarcation between so-called scientific research and applied research, but even the most abstract research work has considerable practical consequences, atomic research being a notable example. Scientific research is absolutely necessary, and this can be illustrated by the fact that the methodical studies of White and Taylor, which resulted in the evolution of high-speed tool steels, were based on the scientific work of Osmond. Other examples of the practical discoveries resulting from original research work were cited.

The lecturer stressed the necessity of technical education. He asked how it would be possible to understand and explain the phenomena that occur during the solidification of metal in castings, and the foundry defects that may and do occur during this period, if one had not a clear knowledge of the factors that influence and of the laws that govern solidification; and how could the remedies be found with certainty?

### Two Conditions Necessary

Professor Portevin insisted on two essential conditions necessary to carry out research work correctly: (1) Scientific and technical formation of the men in charge, and (2) Specialization in experimental work, both as regards the investigator and the organization of the laboratory. After having made an appeal for better rewards for research workers, the lecturer said that the subjects to be studied should arise, on the one hand from the practical problems brought up by the industry itself; on the other hand from the subjects that emerge from the teachings of foundry practice.

He referred to the scientific committee developed by A. Le Thomas, director of the Technical Centre of the Foundry Industries, and said that this organization answered perfectly to the second condition he had mentioned. He expressed satisfaction at the fact that the essential part played by research in industry had been, at last, recognized in France, at least insofar as the foundry was concerned.

Following Professor Portevin's address, Inspector General Mercier addressed the meeting, conveying his greetings and expressing his wishes for the success of the convention.

Prior to the presentation of the Ameri-

(*Continued on page* 132)

# Announcing

## ...the IMPROVED MAHON Hydro-Foam DUST COLLECTOR

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Now, in spite of the outstanding success of the revolutionary dust control principles involved in the original patented Hydro-Foam Dust Collector, Mahon offers to Industry an improved model . . . a model identical in principle, but simpler in design . . . a model requiring less attention—less service . . . in fact, it is completely automatic in operation—no fabric screens, dust bags or other removable parts requiring cleaning and replacement. Dust is effectively removed from the air and safely deposited under water . . . an automatic sludge removing device, which keeps the sludge tank clear, completes the simple process of dust elimination. Mahon Hydro-Foam Dust Collectors are manufactured in standard units of various capacities and are installed singly or in multiple batteries to handle any volume of air or meet any dust removal requirement. A Mahon engineer will analyze your dust problem and explain in detail the advantages of the patented Hydro-Foam Collector—no obligation.

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# MAHON

(*Continued from page* 130)

can exchange paper, Vincent Delport conveyed the greetings of the American Foundrymen's Association and confirmed the invitation to representatives of friendly associations to attend the 50th anniversary convention in Cleveland in May, 1946. The American exchange paper was then presented by Dr. M. Ballay, director of Centre d'Information du Nickel. The author of the paper was J. S. Vanick, International Nickel Co. Inc., New York, and the title was "United States War Time Developments in Cast Iron Foundry Practice." This paper, describing the shift in foundry output from civilian to military castings, was published in full in the November issue of THE FOUNDRY.

Vincent Faulkner then brought to the meeting the greetings of the Institute of British Foundrymen and, speaking in French, he prefaced the British exchange paper by a brief description of some of the most striking developments that had taken place in the British foundry industry during the war years. The title of the British exchange paper was "Control of Shrinkage Porosity in Castings," by N. A. Baker, British Non-Ferrous Metals Research Association. The paper, which was summarized by A. Le Thomas, dealt mainly with the contraction of metals and alloys during cooling in the liquid state, especially from the point of view of shrinkage porosity in castings. A brief review was given of the effects of cooling between long and short ranges of temperatures of solidification based on the investigation of shrinkage along one direction in ingots, both in regard to the metal and the eutectic. The results were translated to the case of certain types of castings, and the conclusion arrived at was that there exists an optimum rate of solidification which ensures correct feeding and sound castings.

The Belgian exchange paper followed but, before its presentation, Rene Deprez, on behalf of the Belgian foundry association, recalled the difficulties which France and Belgium had victoriously overcome during the occupation and extended greetings and assurances of close collaboration on behalf of the foundrymen of Belgium.

### Recommends Water Quenching

The Belgian exchange paper was presented by its author, Georges Halbert, director, Fonderies Magotteaux, and secretary of the Belgian association. The subject was "Martensitic Hardening of Cast Irons." The author explained that ordinary gray irons are susceptible to hardening by quenching at a temperature beyond the critical point, this operation being followed by annealing. He said that this operation was more economical than the addition of special elements in sufficient amounts to ensure the formation of martensite by ordinary cooling. He dealt specially with water quenching and reviewed the effects of silicon, carbon, manganese, oxygen, duration of the heating period before quenching, and effect of phosphorus. A. Le Thomas said that such studies presented considerable interest in connection with parts such as machine tool slides. Professor Guillet also stressed the interest of the paper; he said he was not convinced that the best method of hardening was by using the heat of the casting, and he mentioned the considerable development of hardening by high frequency currents, as exemplified in the manufacture of crankshafts by Ford.

The following papers were also presented at the meeting:

"Investigation on the Dispersion of Mechanical Tests on Cast Irons—Application to the Study of the Mechanical Properties of the Effects of Deoxydizers on Pearlitic Irons," by Dr. Paul Bastien, professor at Ecole Centrale de Arts et Manufactures, president elect of the French association, and Jean Prache, chief metallurgist, le Creusot.

"Contribution to the Study of the Effects of Silico-Calcium Additions on the Properties of Gray Cast Iron," by Georges Delbart, Andre Thorel and Rene Bucquet.

"Superficial Hardening of Cast Iron by the Oxy-Acetylene Blowpipe," by Elie Daynie, metallurgist, Societe l'Air Liquide.

"A Study of Electrochemical Corrosion of Cast Iron in Relation to Its Application to Microscopic Metallography," by Prof. F. Girardet, Saint-Die, Vosges.

"Fluxes and Slags in Metallurgy," by Dr. Ing. H. Lepp.

"Synthetic Sand in the Magnesium Foundry," by M. Potemkine, chief metallurgist, Societe Le Magnesium Industriel, and M. Fieben, Societe Francaise des Glycerines.

"Effects of Foundry Practice on the Aspect of Finished Castings," by M. Herenguel, chief research worker, Trefileries et Laminoirs due Havre.

"Special Ajax Susceptible to Heat Treatment," by J. Castel, Cie. Alais Froges and Camargue.

"A Study of Copper-Nickel-Silicon Alloys Having High Mechanical Strength and High Electric Conductivity—Sand Molded," by M. Loiseau, director, Societe le Bronze Industriel.

"Present Trend in the Design of Testing Machines," by A. Tenet, consulting engineer.

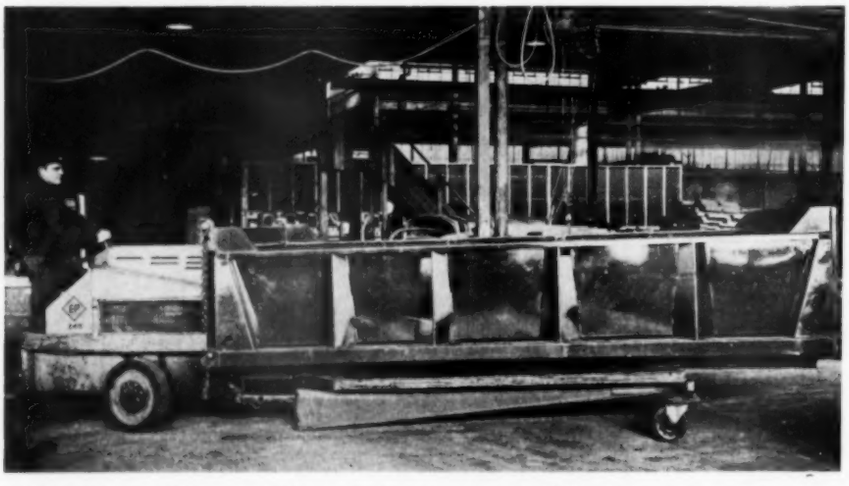
"Portable Electrical Dryers for the Foundry," by Georges Maniere, Cie Electro-Mecanique.

"Some Comments on Time Studies," by M. Dennery.

"Schedules for Fixing Working Times for Molding, Coremaking and Fettling," by R. Salmet, Societe des Acieries de Longwy.

The meeting concluded with an address by A. Le Thomas, director of the Centre Technique des Industries de la

(*Continued on page* 134)



**FOR LONG, HEAVY LOADS: A simple two-wheeled dolly, fabricated from steel plate, when used with a low-lift platform truck provides the means for readily handling long and heavy objects. It is shown here transporting a dump-truck body. The dolly has its sides shaped and turned down, with the forward end mounted on wheels and the rear end resting on the floor. Upper surface of the dolly is practically level, at a height making it easy for the truck's platform to be pushed underneath it. When the rear end of the dolly is lifted off the floor the load is supported on wheels, four on the industrial truck and two on the dolly, and can be moved easily. (Photo courtesy of the Elwell-Parker Electric Co., Cleveland)**

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# MAN-TO-MAN on the Molder's Bench

## "The Open-Door Policy"

By RALPH L. LEE

AS FAR back as I can remember, office doors of general managers, superintendents, department heads, foremen and other shop supervisors always were supposed to be open to any employee to come in and discuss his personal problems. I have been hearing more than usual lately about the open-door policy.

This came to mind sometime ago when I went through a large foundry with its personnel director. He was one of those fellows who insists upon your calling him by his first name just after you meet him. Being the same sort of a person myself, we clicked right off the bat. He had been with the same outfit since he left school—had worked on all kinds of jobs in the place and knew most of the employees by their first names.

Since Andy was very proud of their new locker room, we started off in that direction: however, we were stopped at the door by a big strapping colored fellow who, from his glance in my direction, I could see had something personal on his mind to discuss with Andy. So I politely turned my back on the two to watch a fellow with sort of a bulldozer handling tons of molding sand more skillfully than I could handle pounds of it with my pet shovel.

Andy finally tapped me on the shoulder and we did go into the locker room which, by the way, was well worth inspection—large, airy, clean, bright and splendidly equipped. We had one heck of a time though, getting to the things Andy wanted to show me, for everywhere we turned someone buttonholed Andy with a personal matter. The same thing happened as we went down through the gray iron department and the frequent auto-calls evidently had folks on the other end of the wire with more personal problems for my guide Andy.

I complimented Andy on the fine man-to-man relationships he must have developed with those who hailed and stopped him. I also told him

that, while I did not eavesdrop, I noticed from the expressions of those with whom he chatted they were perfectly at ease with him, wholly themselves without any seeming consciousness of their position in relation to his. In view of the fact that during our trip he had talked to or greeted people who ranged in position from sweepers to superintendents, I couldn't help feeling Andy was a master at dealing with people on a man-to-man basis and I told him so.

"Well Doc," he said, "thanks a lot. It is certainly fine to hear things like that but believe me, boy, I have a long way to go before I will even begin to feel I have my job half done. I noticed you did not listen to what these dudes had to say. The fact of the matter is most of them were trying to take things up with me they should have taken up with their own bosses. I spent a good deal of my time on this trip with heading them in the right direction.

"This is the thing that worries me, Doc. So many of our bosses don't seem to have the hang of making their boys feel the same way toward them they evidently feel toward me. While I appreciate there is bound to be some feeling of self-consciousness between the boys who do the work and those who are hired to see that they do it, I won't feel that I have made much of a dent in my job until I can walk down through the plant without being stopped at every turn with personal matters as I have been today.

"Now don't get me wrong Doc, I am proud of knowing everyone in the place by his first name and I think a personnel director should have his door wide open to anyone in the plant who wants to see him on any subject, personal or otherwise. But Doc, I think it is a damn sight more important each foreman has his door wide open to his people on the same basis, not only the foremen but the general foremen to their foremen, the superintendents to their general foremen and the big boss to everybody in the plant. Getting these doors open is my most important job, far more important than being a wet nurse for chronic belly-achers or a bridge for disgruntled employees to climb over their bosses' heads."

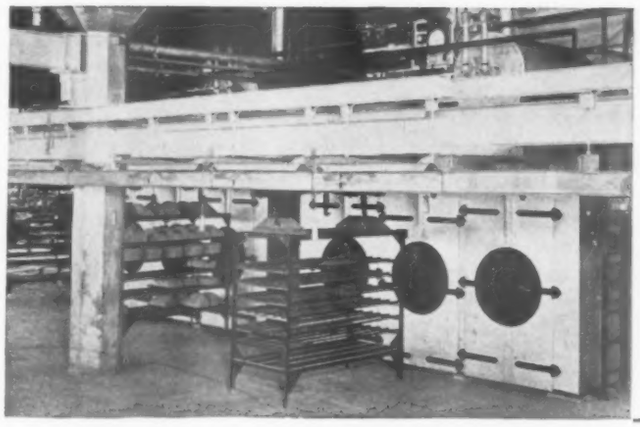
Willingness on the part of all who supervise to give the time it takes for listening to employees is the only key I know of which will truly unlock the doors which separate management from employees. Even then the key won't work unless each supervisor listens attentively, patiently, non-paternalistically, with an open mind, free from self-consciousness and class distinction.

(*Continued from page* 132)

Fonderie, on "The Technical Effort in the Foundry." After recalling the very high level attained by the foundry industry in France in the years following the first world war, the lecturer referred to the great handicap which the industry had suffered because of the war and to the necessity of re-equipping French foundries in order that they may be in a position to meet postwar competition from countries whose industries had been stimulated by the late war.

He mentioned that a considerable number of undertakings had applied to the Centre Technique de Fonderie for advice on the replanning and re-equipping of their foundries, and that necessary steps had been taken fully to satisfy these requests. He stressed the importance of mechanical handling, and mentioned a case where it had been necessary to handle 250 tons of materials and plant to

(*Concluded on page* 136)



*Part of large Carl-Mayer Rack Type Oven installation at The General Electric Co.*

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- General Electric Co.
- General Motors Corp. and Subsidiaries
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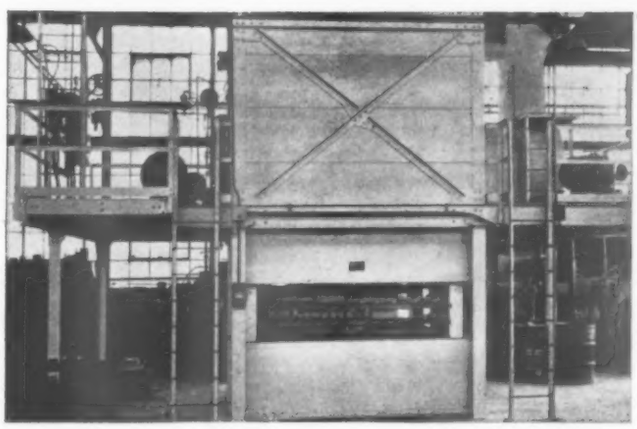
# CARL-MAYER

## CORE AND MOLD OVENS



*Typical large Vertical Carl-Mayer Oven as installed in a General Motor Corp. Plant*

FOR more than twenty-five years, Carl-Mayer oven design has contributed to highest production and efficiency in the core department.

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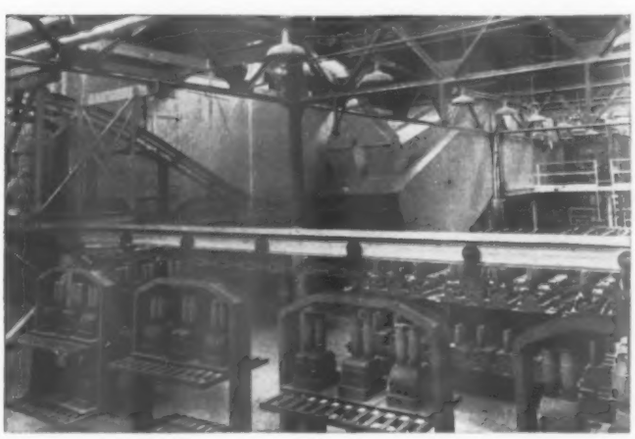
That's why leading foundries, like those listed above, choose Carl-Mayer Ovens repeatedly in face of wide competition.



*Carl-Mayer Monorail Core Oven at Packard Motor Car Co.*

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*Write for Bulletin No. 141*

## The CARL-MAYER Corp.
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(*Concluded from page* 134)

produce one ton of castings. It is also an essential necessity to modernize methods of working, not only from the point of view of labor but also in regard to actual foundry practice and technique.

The lecturer then referred to the necessity of scientific formation of foundry engineers. He mentioned that the Comite Technique des Industries de la Fonderie had set up a scientific committee, sponsored by Professor Guillet and presided over by Professor Portevin, to take over such fundamental researches and studies as could not be performed in the ordinary laboratory. The lecturer also stressed the equal necessity for technical research; in other words, the applications of scientific research, and he encouraged young men to pursue this line intensively.

Following this address, Professor Chevenard announced that he was transmitting the presidency of the Association Technique to Dr. Paul Bastien, who suitably acknowledged the honor done to him and expressed his firm intention of continuing in the footsteps of his predecessor.

# PATTERNMAKING INDUSTRY

## Needs Organization, Report Shows

NEED for better organization in the patternmaking industry and for closer co-operation between the patternmaking and foundry industries is stressed in a report issued recently by Frank Cech, Cleveland Trade School, Cleveland, and chairman of the Patternmaking Division of the AFA.

Last April, this division sent a questionnaire to AFA chapters to determine:

1. Whether or not there existed an organized patternmaking division within the chapter or a pattern manufacturers association in the locality but not affiliated with the chapter.

2. To what extent foundrymen and patternmaking discussed jointly their mutual problems.

The motive back of this inquiry was to discover how well the patternmaking industry was organized, and what agencies were established that might be contacted for information or for the dissemination of information relative to pattern and foundry problems.

### Problems Long Recognized

When a Patternmaking Division was organized within the AFA, it fell heir to problems long ago recognized by the AFA and other foundry and kindred organizations. To help solve these problems committee appointments were sought, but the appointment of such committees was tabled for the time being because of the lack of the foregoing information or the lack of necessary facilities to carry on impartial tests and experiments.

Replies to the questionnaire were received from 23 chapters. An analysis of the answered questionnaires shows:

That but three chapters have a patternmaking division within the chapter, namely: Milwaukee, Wisconsin Chapter, Milwaukee; Chicago Chapter, and Texas Chapter, Houston.

That two organized patternmaking divisions exist in the locality of the chapters, namely; Pattern Manufacturers Group of the Associated Industries of Cleveland, and St. Louis District Pattern Manufacturers Association of St. Louis.

That eight chapters have speakers available for talks of interest solely to patternmakers or patternmakers and foundrymen combined. All would like a list of available speakers.

That 11 chapters hold occasional (one or two) meetings a year that directly attack the foundry problems from the patternmaking angle.

That the question: "What have you done during the past year to help clarify the mutual problems that confront the patternmaker and foundryman" evinced some surprising replies as the following reveal:

"We try to get pattern men out to our meetings because they should know all they can about foundry practice."

"We held one general meeting this year on Pattern Engineering where all these problems were discussed."

"Upon return to normal conditions it is the intention of————chapter to expand, one of the phases of which will be patternmaking and its affiliated subjects."

"One discussion on pattern design. (A worthwhile program and anything we can do to assist will be gladly offered.)"

"Nothing specifically."

"Frankly nothing."

"Had one meeting on patterns; establishing an educational course."

"We held one meeting on Pattern Engineering."

"We held one meeting on Patternmaking."

"One meeting per season is devoted to patternmaking."

"We are forming an educational committee at present to promote interest in the younger generation."

"We try to hold one meeting per year related to pattern problems."

"Nothing."

"Held one group meeting with patternmaking as speakers; invited pattern shops specially."

"We have many patternmakers and their apprentices attend each monthly meeting, but no special division for patternmakers has yet been considered."

"In addition to the usual discussions at our regular meetings, we recently had a meeting on 'Co-operation between the Patternmaker and Foundryman.'"

There have been several discussions. In fact, the writer has stressed the importance of full co-operation, not alone between the pattern shop and foundry superintendent, but the engineering department as well. In brief, all three should discuss their problems."

"Held a meeting for engineers, patternmakers, foundrymen and machine shops."

"Held one meeting this year on patterns."

"Work has been done by the patternmaker jobbers outside of the AFA. So far little interest has been created."

"Program shows the pattern meetings."

"Five speakers on Foundry Practice and Patternmaking and have just organized a patternmaking group."

### Division Needs Organization

After due consideration, the following conclusions were arrived at:

1. That the patternmaking industry, when compared with other industries is in sad need of organization.

2. That much is said of the necessary closer relationship or co-operation. of the patternmaking and foundry industries, but by comparison little is actually done.

3. That chapters of the AFA are so organized that they all clear through a central body and are in a good position to contact existing Pattern Manufacturers Associations for affiliation with them or create patternmaking divisions within the chapters.

4. That engineering societies should be invited more often to sit in on discussions of patterns and castings, in order that these groups may have the casting industry kept constantly before them.

5. That the listing of speakers appearing before the various chapters on a card similar to the one included and sent to the AFA headquarters would eventually make available to all chapters a speaker's bureau. This would not only help chapter program chairman, but also help to disseminate information that could be used in meeting competition with the casting industry.

# With new ALLOYS you can get better metals at no higher cost . . .

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# QUAD-CITY CHAPTER
## RESUMES CONFERENCES

By FRANK G. STEINEBACH
*Editor*
THE FOUNDRY

QUAD-CITY Chapter of the AFA resumed its regional conferences with a two-day meeting held at the Hotel Blackhawk, Davenport, Iowa, Nov. 15-16. Registration totaled 275 and considerable interest was displayed in the various technical sessions and roundtable discussions provided on the program. The conference was opened with an address "The Future of the Foundry Industry" by Fred J. Walls, International Nickel Co., Detroit, and president of the American Foundrymen's Association. C. E. Von Luhrte, Chicago Retort & Fire Brick Co., Davenport, and chairman of the Quad-City Chapter, presided.

In looking toward the future, President Walls indicated rather gloomy possibilities unless certain federal regulations are modified. This is particularly true of the gray iron branch where the small price increase recently allowed does not compensate for increased labor costs. Mr. Walls then pointed out that if these difficulties are eliminated, foundrymen, to bring about a healthy and prosperous future, can direct their efforts toward a better understanding of the industry on the part of the public, toward improvement in practices which will benefit both workers and owners, and toward research in foundry practices and products.

### Companies Carry On Research

Mr. Walls stressed the fact that while the developments brought about during the war will have marked influence on the future of the foundry industry, and that the findings of noncompetitive government research will be of benefit, the most valuable research to the industry is that which is being carried on by individual companies to insure their future well-being. This type of research covers a field much broader than product or processes, and extends to the comfort of human beings, both within and without the foundry industry. The speaker stated that since castings are basic to all industries, this type of research means a big future for the industry, as it will improve the quality of castings and conditions under which they are made.

President Walls also warned the conference that all foundrymen should be concerned with trends that are taking place in fabricated structures, some parts of which are castings. He pointed out that the increased capacity in forging, stamping and welding facilities, together with improved practices in those fields, point to much greater competition unless the trends toward greater refinement in the casting field are fully developed, both by individual companies and through co-operative effort. Some of these trends are closer dimensional tolerances, better finishes, and castings made by such processes as investment casting, vacuum casting, centrifugal casting, permanent mold, and plaster casting. The speaker discussed in some detail the developments which have taken place in these fields.

C. E. Von LUHRTE
*Chairman, Quad-City Chapter*

The second session of the morning meeting featured a talk on "Mechanization and Improvement of the Foundry" by Lester B. Knight, Lester B. Knight & Associates, Chicago. Mr. Knight stated that, in his opinion, foundry modernization includes modern thinking by owners, managers and operators as well as modern physical facilities. It includes modern sales engineering methods of marketing the product, as well as modern production methods to produce it. Those foundries marketing a casting to do a particular job, or perform a special function, are enjoying better business and profits than those attempting to sell metal at so much a pound. The speaker listed the steps necessary to accomplish the modernization of a foundry as follows in order of their importance: 1. Organization; 2. Procedures and Methods; 3. Costs; 4. Facilities.

Mr. Knight stated that the modern foundry must be properly organized with clear-cut lines of responsibility and authority commensurate with that responsibility. The superintendent should be provided with a specialized staff of assistants for advice on metallurgical and engineering problems, and he should be able to devote his time to the broad aspects of producing high quality castings at low cost, and not be confined by the multiplicity of technical details. The speaker pointed out that many foundries today have established a committee to review all patterns for castings that are to be produced, and this committee recommends in detail the method of production, gating, risering, pattern design, amount of coring, size of flask, method of molding, and other factors of production.

### Inspect the Scrap

Under the subject of procedures, Mr. Knight stated that many foundries have established regulations requiring hourly or daily inspection of the scrap by foremen so that causes of such loss may be analyzed and corrected as quickly as possible. There is no question but that foundries should know the cost of various operations in the plant. Without such information it is difficult, if not impossible, to control costs and keep them near the optimum low level. Mr. Knight discussed factors affecting costs, such as labor, patterns and methods of rigging the job, equipment, etc.

Mr. Knight stated that the first step of any foundry interested in mechanization should be the preparation of an analysis or survey of each of the several departments in the plant, with a close check on methods and costs in each department. Most foundries have developed from small beginnings over a period of years and very seldom has the overall layout been subjected to a careful scrutiny and analysis. After proper consideration of the overall layout, any major expenditure should be self-amortizing in direct material and labor savings in not more than three years of operation. Mr. Knight stat-

(*Continued on page* 142)

# INTERNATIONAL MOLDING MACHINE COMPANY'S....

*New Home* —— This new plant will make possible, better facilities for High Production of New and Larger Molding Machines . . . incorporating the very newest in Foundry engineering improvements . . . and found only in INTERNATIONALS.

## INTERNATIONAL MOLDING

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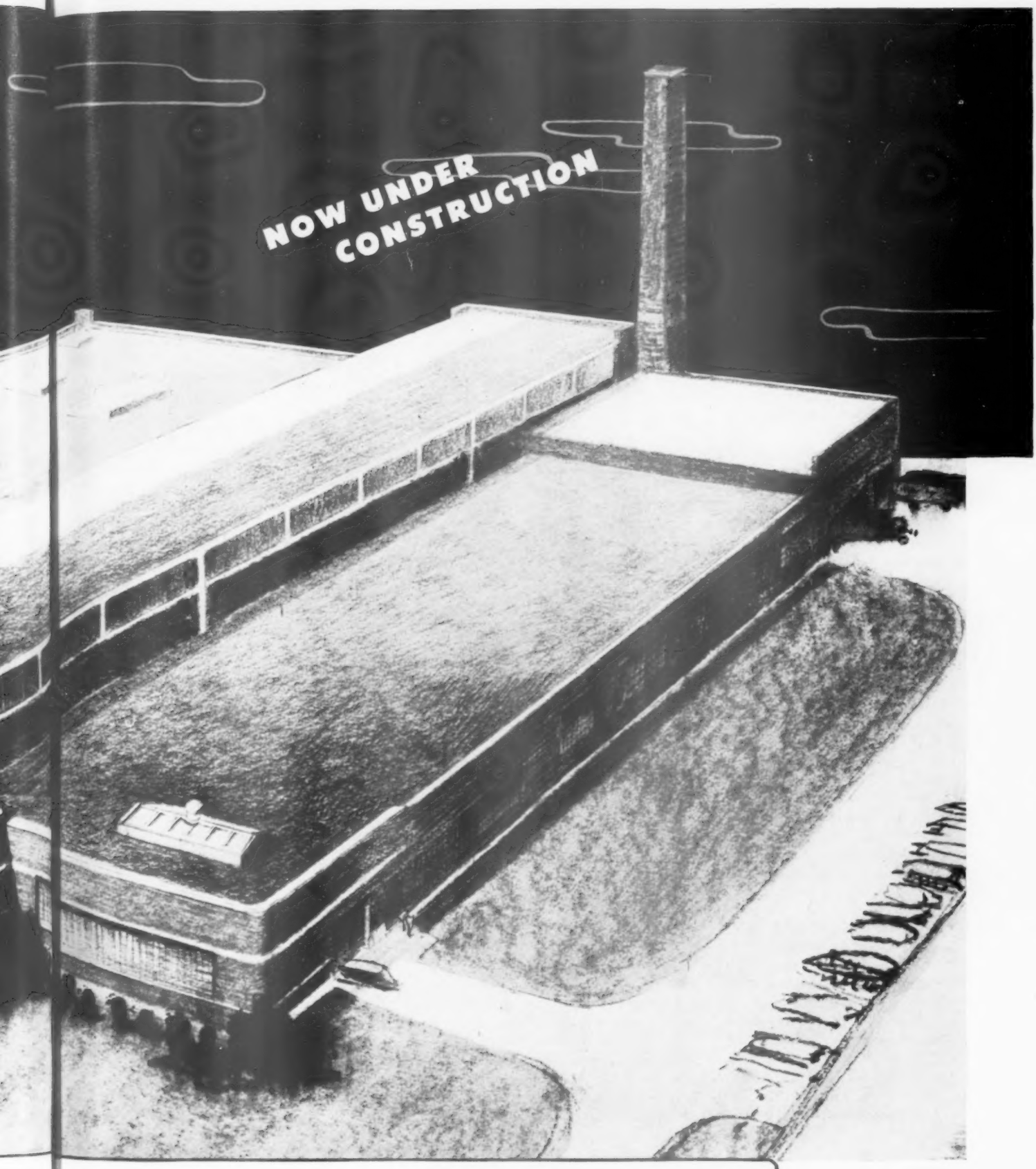


# MACHINE COMPANY

STREET, ★ CHICAGO 8, ILL.

...ow track of the Indiana Harbor Belt R. R. serves the new location, which will be ready for use about May 1, 1946.

(*Continued from page* 139)

ed that no foundry should jeopardize its working capital to install additional facilities. In his opinion, modernization should be taken piecemeal in a series of projects planned to fit the financial situation of the company, or outside money should be used on a basis which will permit the saving to return the invested funds in the period indicated. Mr. Knight showed a number of slides illustrating interesting types of foundry mechanization projects.

The luncheon on Thursday noon featured an exceptionally interesting discussion on "Community Relations and Training in the Foundry" by L. J. Fletcher, Caterpillar Tractor Co., Peoria, Ill. H. L. Creps, Frank Foundries Corp., Muncie, Ind., presided. In discussing training within the plant, Mr. Fletcher stressed the need for proper facilities for providing such training. He pointed out that since the only thing which counts in training is the information the man takes out of the training department and puts to work, it is important to have a room which is pleasant and comfortable and well equipped with table, blackboard and other aids. While some training may be done in the local school, it usually has been proved that no school can take care of all of the supplementary training which is needed.

### Select Competent Man

In selecting the supervisor for the training program, it is important to get a man whose first responsibility is the training program. This man should be one who likes people and who in turn is liked by the men who are being trained. He should be completely familiar with the technical end of the foundry and be able to impart this information to the boys in training. The speaker emphasized the need for picking out a man who is successful in what he is now doing and make him the supervisor of the training program. Top management must be behind the training movement if it is to succeed.

At the same time the management should be interested in the matter of community relations. Any plant should be concerned about the way people in the community think of the foundry, and how this thinking influences the operation of the business. Mr. Fletcher pointed out that every man who works in the foundry is a source of information on the plant and while his comment may be only an opinioin, to the person who has an opinion this becomes a fact. Therefore, every employe is a molder of public opinion.

The speaker emphasized the need for taking the people in the community through the foundry. He stated that if these people come in and management finds itself apologizing, it probably is time for management to see that certain conditions are corrected. Therefore, management must do its part in developing a better understanding between the community and the company.

Two group meetings were held immediately after the luncheon on Thursday, one devoted to gray iron, malleable iron and steel castings and the second to nonferrous problems. The ferrous session featured a paper, "Something New in Molding and Core Sands," by Charles Schureman, F. E. Schundler & Co., Chicago, with C. H. Burgston, Deere & Co., Moline, Ill., presiding. Mr. Schureman stated the new thing in molding and core sands is the addition of intelligence and common sense in the making of synthetic sand. In the matter of preparing synthetic sand, he emphasized the need for selecting a high quality base sand having the grain size required for the desired finish on the casting. Grain distribution should be kept in mind when producing a sand for work where expansion becomes a factor.

R. E. WILKE
*Conference Program Director*

Choice of the bonding clay is determined by size and weight of the work, type of casting to be produced, etc. Batch mixing was recommended by the speaker as essential, and information was presented on the details of mixing. Mr. Schureman recommended starting with a dry sand, then adding the exact amount of water. This is followed by the addition of bentonite and other dry ingredients. Control of the sand should be checked carefully by various testing instruments available, and special emphasis should be placed on moisture, flowability and grain distribution.

Expansion, which the speaker considers one of the most important properties of sand, is caused by the heat of the metal acting on the grains. Many defects, such as rat tails, scabs, buckles, draw-downs, veins, cracks, etc., are due to increase in volume of the sand, but no type of defect can be traced to a decrease in volume. The expansion is aggravated by moisture, grain size and shape, mold surface, two dissimilar sand layers too close to the mold surface, kind of bond, method of mixing, kind and amount of organic materials used. The speaker discussed practical remedies for these difficulties.

The nonferrous session featured a discussion by W. B. George, R. Lavin & Sons, Chicago, with C. S. Humphrey, C. S. Humphrey Co., Moline, Ill., as chairman. Mr. George deplored the wide variation in the prices of nonferrous castings, due in the main to the fact that foundrymen do not know their costs or do not use uniform methods in arriving at cost figures. Mr. George then presented an abbreviated method for determining cost estimates, and illustrated this method with a number of detailed breakdowns for bar stock, small loose patterns, loose valves, plumbers goods, and a large 800-lb valve.

### Include Hazard Factor

In this discussion, he stated that overhead usually ranges from 150 to 200 per cent, but he used 150 per cent in his calculations. He also stated that before the war, nobody thought of the factor of hazard, but now everyone figures the hazards of the job in the calculations. These hazards may include losses in the shop, and rejects by customers. The hazard factor varies with the various types of castings produced.

Mr. George also stressed the fact that too many foundrymen do not know, or do not take into consideration, the loss incurred in melting metal. He figured 10 per cent shrinkage in his calculation. It is interesting to note that his calculation showed costs per 100 lb as follows: Bar stock, $28.66; loose plate, $43.56; loose valves, $47.63; plumbers' goods, $29.16; and the 800-lb valve, $60.62. Mr. George concluded his talk with a discussion of melting of nonferrous metals, methods of snapping off heads on manganese bronze castings, etc.

Group session on gray iron, malleable iron and nonferrous castings completed the afternoon program. In the gray iron meeting, James S. Vanick, Internatinal Nickel Co., New York, spoke on "New Horizons for Cast Iron", with P. T. Bancroft, Republic Coal & Coke Co., Moline, Ill., as chairman. Mr. Vanick described some of the movements towards simplification of metal and mold handling operations leading to increased production. He indicated new opportu-

(*Continued on page* 144)

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The products of the Mid-West Abrasive Company — snagging wheels, disks, cones and other foundry type abrasives —are especially designed and manufactured for the production demands of today.

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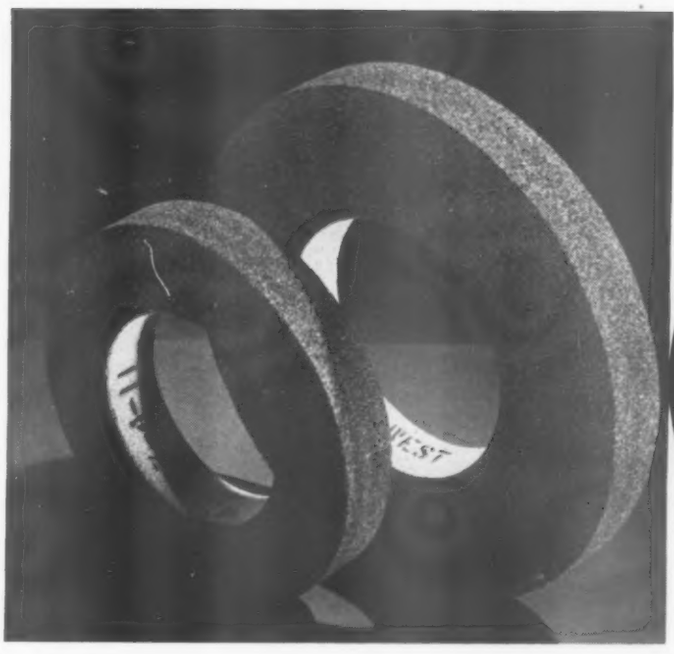

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*Manufacturers of DEPENDABLE Abrasives*

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(*Continued from page* 142)

nities for castings in the strength specification ranges above 50,000 psi, and described methods for producing high strengths in soft and medium grade irons. In this connection, additional simplification of control has been achieved through the use of inoculants which contribute to improved and more uniform quality in castings destined for high production machinery or for structure control in applications requiring wear-resisting surfaces.

Advantages of "as-cast" properties of cast iron in comparison with equal values obtained by heat treatment were dealt with and illustrated as methods for increasing the usefulness of castings where the toughness factor is involved in their application. New opportunities for heat resisting castings were discussed from the low, 600 F max temperature range through the 900 F intermediate temperature range, where strength and machinability are associated requirements. Firebox castings capable of serving at temperatures up to 1600 F with chromium content of 1 to 6 per cent and nickel content of 1½ to 30 per cent were illustrated as offering new horizons for additional applications of gray cast iron.

### Annealing Requires 7 Days

At the malleable meeting, E. Roby, Peoria Malleable Casting Co., Peoria, Ill., and J. Kropka, Chain Belt Co., Milwaukee, led the discussions, with August Van Lantschoot, Fairfield, Iowa, as chairman. Mr. Roby described the annealing of malleable irons at the plant of the Peoria Malleable Casting Co. where eight periodic type annealing ovens, four hand-fired and four pulverized-coal-fired, are employed. The capacity of each oven varies from 30 to 40 tons per charge. The annealing cycle is as follows: Raise to 1600 F, 40 hours; hold at 1600 F, 36 hours; drop from 1600 to 1320 F, 25 hours; hold at 1320 F, 30 hours (refire to hold temperature); drop from 1320 to 1150 F, 35 hours; open oven at 1150 F. This requires a cycle of 165 hours or 7 days. All temperatures given are pot temperatures.

The annealing rings or pots are 18 in. wide, 26 in. long and 15 in. high. The stand consists of four rings placed one on top another, and each stand holds approximately 1500 lb castings. The packing material consists of cinders mixed with a small amount of pulverized coal. The packing material must be dry, since if wet it will adhere to the castings and also cause scaling of the castings. Thermocouples are inserted in pots at the front and rear of the oven. Recording pyrometers are used to provide accurate temperature control. Ovens are charged with a fork truck and this truck also is used in handling the oven doors.

The company uses conventional mills for cleaning hard iron castings, except in the case of certain light castings which are sandblasted or rough-cleaned with a wire brush so that a rough inspection may be made. Soft iron castings are cleaned with mechanical blasting equipment. The speaker pointed out that it was important to run the cleaning machine at full capacity to insure the lowest cost of machine maintenance. Time required to clean a load of castings is from 4 to 8 minutes. Some small castings and chains are cleaned in mills.

Mr. Kropka discussed the air furnace practice at the Chain Belt Co. plant. He pointed out that all pig iron is checked for chemical analysis at the plant and that railroad scrap frequently is checked for analysis. The company

prefers to use steel rails, due to uniformity of analysis, and ease of handling. The charge is composed of 30 per cent pig iron, 50 per cent sprue, 10 per cent scrap and 10 per cent steel. During the meltdown, carbon, silicon, and manganese are oxidized to a certain extent. The amount of oxidation depends upon the melting procedure.

In charging, the malleable sprue is placed on the furnace bottom and this is followed by the malleable scrap and pig iron. Steel is placed in front of the burners to get a fast meltdown. When using railroad scrap or other coarse scrap, this is charged first to permit rapid heating by soft coal with volatile matter of 20-22 per cent, ash 4 to 5 per cent, sulphur 0.6 per cent and Btu 14,000 to 15,000. A slightly smoky flame is preferred on the meltdown to prevent excessive oxidation. Coal consumption is from 700 to 900 lb per ton of melt. Brick consumption on side walls runs between 4 and 6 lb per ton of melt. Mr. Kropka also discussed molding practice, sand control, difficulties encountered in faulty equipment, including flasks, methods of heating, etc.

In the third meeting, Roy Thrush, Reynolds Metal Co., Springfield, Mass., discussed "Light Foundry Practice," with John H. Diedrich, Blackhawk Foundry & Machine Co., Davenport, Iowa, in the chair. Mr. Thrush stated that the making of aluminum castings is not difficult when the characteristics of the metal are understood. Certain of these are natural properties of aluminum itself, which are retained in all of its alloys, while others are the result of alloy additions and therefore peculiar to specific alloys. Aluminum alloys have two characteristics which become important factors in determining the degree of success obtained in casting. The first is the marked tendency to absorb certain gases, particularly hydrogen. The second is the readiness with which aluminum alloys combine with oxygen to form oxides and dross. Severe gas absorption is likely to accompany severe oxidation and drossing so that good metal handling to eliminate one will reduce the other.

Hydrogen gives the aluminum foundrymen the most concern. The source of hydrogen can be moisture which naturally occurs in the atmosphere, moisture or hydrogen formed as a product of combustion, moisture or other hydrogen forming materials combined with or absorbed by the surface of the aluminum ingot, and hydrogen retained in the ingot in the form small internal holes or porosity. Therefore, good metal handling and melting practice are essential to the production of quality aluminum castings.

### Provide Pyrometric Control

Without means of measuring metal temperatures, Mr. Thrush stated that even the best furnace may produce inferior metal. Gas absorption and the oxidation tendencies of aluminum alloys increase with the temperature of the molten metal. Aluminum alloys that have been overheated will show a coarse and more porous structure than alloys which have been melted properly. Holding the metal at even moderately high temperatures tends to coarsen the grain structure. Since it is not possible to judge the temperature of the molten metal by its color, as is the case in certain other metals, it becomes necessary that each furnace, even if not equipped with automatic temperature control, be provided with suitable pyrometric equipment.

Agitation of molten metal increases oxide formation. Continual skimming increases the total oxide loss, and each time a protective coating is removed a new one forms. If the metal must be stirred, this should be done from the bottom upward and the surface should be disturbed as little as possible. It is preferable to skim only when ready to take the metal from the furnace and prior to pouring. Great care must be exercised with both solid and gaseous

(*Continued on page* 146)

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(*Continued from page* 144)

fluxes, to be sure that no moisture is present. Fluxing should be done at temperatures of 1350 F max.

In general, molding methods employed for all metals are usually satisfactory for aluminum, but certain properties of aluminum alloys establish certain preferred practices. Molds rammed in snap flasks using an offset plate usually can be poured without jacket bands or waists. Molding and gating practice must be such that delivery of metal into the mold is accomplished with minimum amount of agitation. Gating and risering are very important, with the strength of the castings being dependent to a great extent upon proportion and location of the gating system.

Mr. Thrush stated that multiple gating is recommended for aluminum. The greater the number of gates, the lower the pouring temperature required. To insure minimum metal agitation entering the mold, gate should be designed with a total cross-sectional area larger than the cross-sectional area of the runner. The cross-sectional area of the runner also should be larger than the cross-sectional area of the sprue. Round sprues are not recommended for aluminum. The use of rectangular or wedge sprues is more effective in reducing metal agitation. The speaker also discussed molding sand, pouring, the principal defects of aluminum castings, the production of cores, inhibiting agents, cleaning, chipping and inspection.

An interesting address, entitled "North of the Ears," was presented by Strickland Gillilan, Washington, at the banquet on Thursday evening.

### Good Sand Needed

The Friday morning session featured a talk "Core and Mold Surface Castings" by J. A. Gitzen, Delta Oil Products Co., Milwaukee, with Frank W. Shipley, Caterpillar Tractor Co., Peoria, Ill., as chairman. Mr. Gitzen stated that the subject of core and mold surface coating is one of the few phases of foundry operations that still needs considerable investigation on a cooperative basis. He stressed the fact that the mold or core coating is only as good as the sand on which it is put. A good coating cannot offset a poor sand base.

A core coating is used to raise the fusion point of the sand and to seal the surface of the core, thus preventing gas from organic binders working back to the surface of the metal. He stated that the coating should raise the hot strength of the sand and help prevent expansion. It is important to use only enough coating to fill the voids and prevent penetration of the metal into the sand. Any amount in excess of that is wasted and may cause difficulty.

According to Mr. Gitzen, a good core wash should be easily mixed, should remain in suspension, should be smooth and provide no chemical reaction with the sand, should be applied readily by dipping, swabbing, spraying or brushing, must have the property of adhering to the sand and should be waterproof. The speaker stated that progressive foundries mix washes on a Baume gravity basis. Standards are established after careful study and these standards are checked several times a day. If these checks are not made, evaporation may thicken the wash and more will be used than is needed. Practically all washes have a specific gravity at which they do not show any drips.

### Wash Should Be Oven-Dried

Mr. Gitzen stated that ordinary air drying of washes on dry sand cores is not sufficient and that the cores should be oven-dried. He also stressed the point that core washes should be judged only on what they will do at high temperatures, not the appearance on the core at room temperatures. He stated that washes must be non-reactive with molten metal and that they should be self-peeling, if possible. The speaker pointed out that while mold washes do not heed all of these factors, green sand molds sprayed with washes should produce gas vapors similar to those provided by sea coal. The washes definitely should obliterate gases ahead of the molten metal, but should have refractory properties when the metal hits the wash. An interesting discussion followed this presentation of the paper.

At the luncheon, Prof. Walter L. Daykin, College of Commerce, State University of Iowa, Iowa City, Iowa, discussed "Modern Relationship between Top Management and Supervision." The speaker indicated that we are faced with many problems in the plants today which developed normally from the American philosophy of life. In his opinion, when one educates the workers, problems are created. It has not been the philosophy to teach workers to be satisfied, but rather to teach them that there is room at the top. All demands which now are being made are closely related to security. In his opinion, labor is interested in maintaining jobs. He expressed the belief if management knows the problem, perhaps it may not be able to solve it completely, but there is the possibility of preventing some of the many difficulties which may arise.

In the first of three afternoon sessions, Ralph Clark, Electro Metallurgical Co., Chicago, discussed "Cupola Operation," with R. E. Wilke, Deere & Co., Moline, Ill., as chairman. The speaker stated that while there had been much written on on new equipment for cupola operation, poor operation still exists with good equipment and good operation is found with inferior equipment. The answer is not only in equipment, but in doing all things right. These include the following: (1) Check all scales periodically; (2) Tare weights on all equipment used for weighing components; (3) Proper type of labor on charging; (4) Proper maintenance of equipment.

The speaker then discussed briefly some of the fundamentals of cupola operation. Considerations involved in obtaining metal of the proper composition and temperature include: (1)Properties of the coke; (2) Contour of the cupola lining, and dimensions: (3) Quality of charge material: (4) Blast. Mr. Clark stressed the necessity of charging the same kind of material charge after charge and day after day. This is necessary if consistency is to be obtained.

Kind of coke used may depend on kind of operation. For a short stack a "flashy" coke is best; for a long stack, the coke must hold up until it reaches the bed or melting zone. The most important property of coke is consistency from one car to the next. Analysis and structure also are important and should not vary widely. Size of coke has a definite effect on operation. The speaker also discussed briefly coke reactivity and stated that a coke too reactive burns too fast and too close to the bed but will give very hot iron. A low combustibility maintains a higher bed but doesn't take high blast well.

### Determine Height of Bed

The initial bed height and operating bed heights were also discussed and it was brought out that a good operator should be able to determine from the chill test, color of slag and fluidity whether the bed was high or low. A low bed is indicated by high chill, fine-grained iron and dark fluid slag; a high bed by lower chill, a lighter colored slag and more wool at the slag hole.

Considerable discussion followed conclusion of the talk. A number of points brought out were as follows:

(1) A short stack usually results in higher total carbons but more coke is usually required due to less preheating of the charges.

(2) Flux should be used directly on bed and continued on each charge thereafter. This results in better slagging at start and cleaner cupola.

(3) Excess lining loss at one point may be due to excess limestone on one side, method of charging or type of blast pipe connection to wind box. Single tangential blast pipe connection may cause

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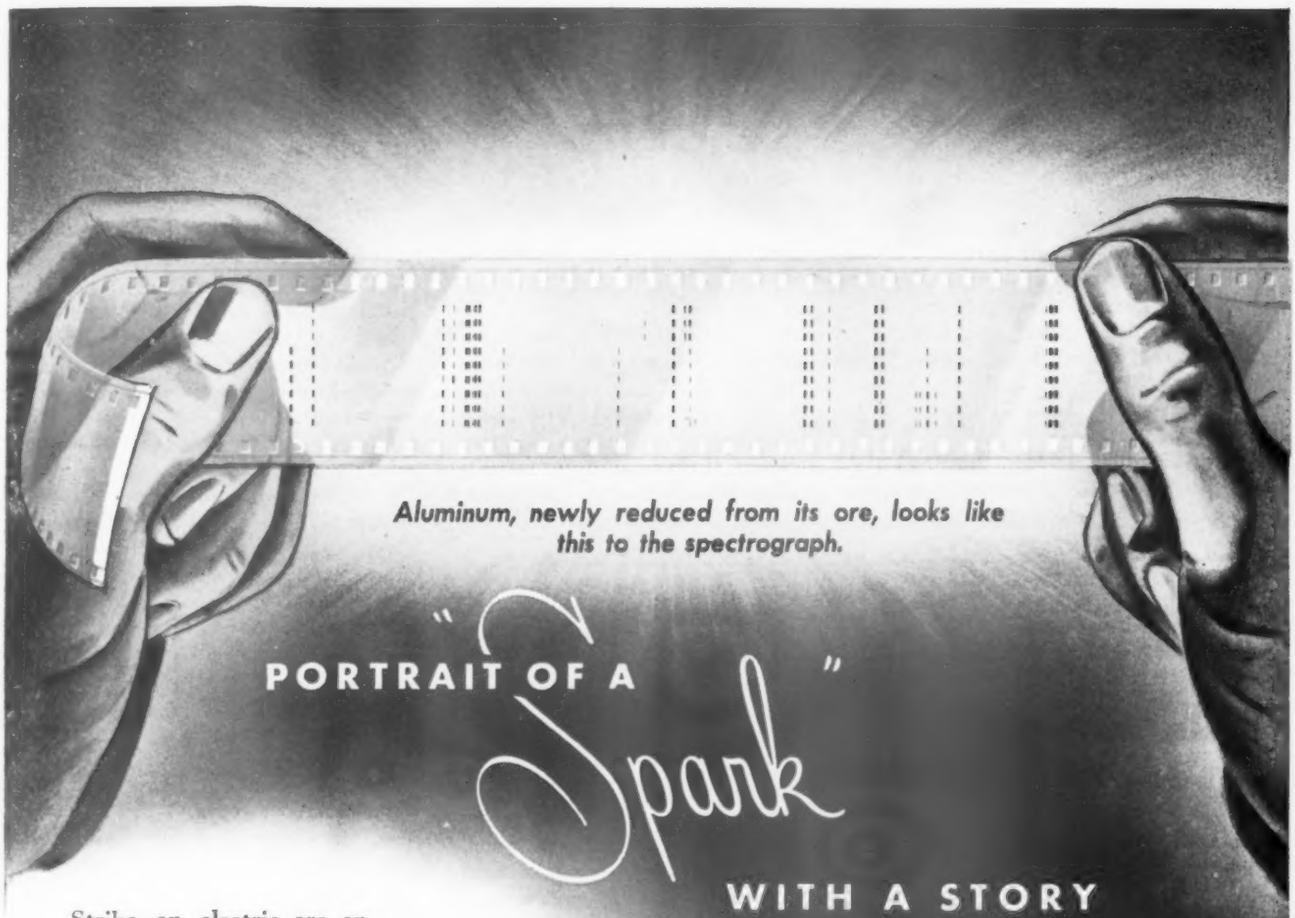

*Aluminum, newly reduced from its ore, looks like this to the spectrograph.*

# "PORTRAIT OF A Spark"

## WITH A STORY

Strike an electric arc on aluminum as it comes from Alcoa's reduction pots, and this is what the spectrographic camera records. Every significant element in the metal is exposed for examination.

Thus aluminum, new-born, faces the glaring light of Alcoa inspection for the first of many times —Alcoa Quality Control at work for you. Analyzed in this manner and graded, that lot of aluminum is allowed to leave the reduction plant.

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ALUMINUM COMPANY OF AMERICA, 1823 Gulf Bldg., Pittsburgh 19, Pennsylvania.

**ALCOA** FIRST IN **ALUMINUM**

ALCOA ALUMINUM

(*Concluded from page* 146)

more lining "burn-out" on side *opposite* to entrance.

(4) Bridging may be reduced by lowering slag hole and using higher combustibility coke.

(5) Use same blast volume at start of heat as will be used during heat. It is desirable to use constant blast volume when possible.

(6) Proper and uniform distribution of the charge, fuel and flux necessary for good operation, economical operation and consistent results.

(7) Important to have competent man on melting.

In the nonferrous meeting "Melting Furnaces for Nonferrous Foundries" was discussed by E. J. Geittman, Fisher Furnace Co., Chicago, with Mark Ashmore, Ferro Bronze Corp., Moline, Ill., as chairman. The speaker stated that the various types of furnaces used for melting nonferrous metals include crucible, iron pot, steel pot, cast steel pot, indirect arc electric, high and low frequency electric induction, open flame, rotary, reverberatory, induction crucible and cupola. Of these, the commonest types are those using a crucible or an iron and steel pot.

For brass and high temperature work, a silicon carbide lining has an advantage, while for aluminum, zinc, etc., a firebrick lining is satisfactory. Crucible, pots and refractories are not cheap and the life obtained from these items is only as good as the combustion equipment on the furnace. A furnace which cannot maintain a neutral atmosphere, will oxidize crucibles and refractories or burn out iron pots. Furnace maintenance is an important factor in the cost of producing castings.

Mr. Geittman indicated that much has been learned about automatic temperature control equipment for furnaces in permanent molds and die casting work. He stated that a good controlling pyrometer is needed. Special piloted burners capable of being turned off entirely and re-ignited are required. To avoid storing up excessive heat in furnace linings, linings good for high temperatures but with low storage capacity must be used. Today the object is to provide an automatic furnace to go with an automatic machine.

John Perkins, Ford Motor Co., of Canada Ltd., Windsor, Ontario, discussed "Centrifugal Castings," with R. H. Swartz, Ordnance Steel Foundry Co., Bettendorf, Iowa, as chairman. Mr. Perkins stated that centrifugal castings are divided into the following three different types; Centrifugal; semi-centrifugal; and true centrifugal. Taking much of the data from the paper "Centrifugal Castings" which was prepared by Peter Blackwood and Mr. Perkins and presented at the 1944 convention of the AFA, Mr. Perkins explained these three types and also showed the resulting advantages derived by the Ford Motor Co. of Canada in using the centrifugal process.

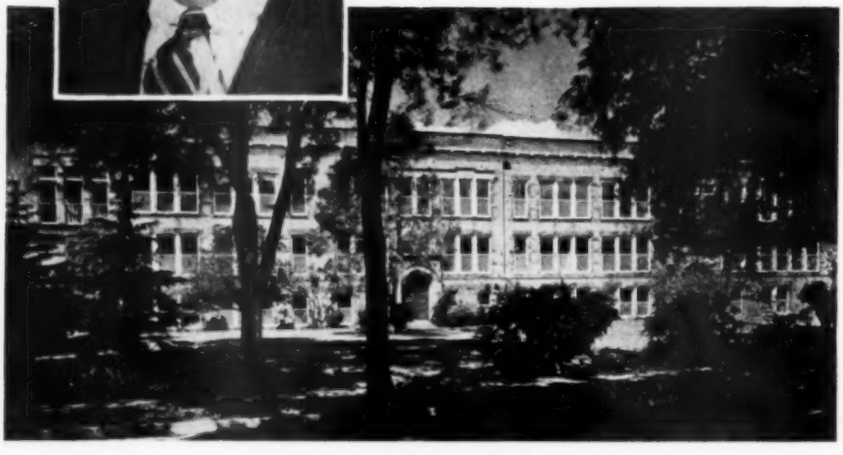
The speaker discussed various problems of molding and pouring, illustrating this feature with certain examples. He discussed heat treatment of the castings, and in conclusion stated that the production of precision castings is a new field which his organization was developing just prior to the recent shutdown because of labor troubles. Upon resumption of work at the plant, the company intends to follow up this field. Mr. Perkins stated that it is felt further experiments will show that even without the use of the lost wax process, it will be possible to cast tools by using pressure molding and centrifugal casting, and that this can be done on both a practical profitable basis.

The committee for the regional meeting was headed by C. E. Von Luhrte, Chicago Retort & Fire Brick Co. C. S. Humphrey, C. S. Humphrey Co. was co-chairman, W. H. Sundeen, Ordnance Steel Foundry Co., secretary-treasurer, and R. E. Wilke, Deere & Co., program director. The committee consisted of the following: R. H. Swartz, Ordnance Steel Foundry Co.; A. D. Matheson, French & Hecht, Inc.; F. W. Shipley, Caterpillar Tractor Co.; A. H. Putnam, A. H. Putnam Co.; W. E. Jones, Ordnance Steel Foundry Co.; August Van Lantschoot, Fairfield, Iowa, and M. H. Liedtke, International Harvester Co.

## Appointed Director of Foundry Research

O. Jay Myers recently was appointed director of foundry research, Werner G. Smith Co., Cleveland. Mr. Myers will head a new department which will be devoted to original research on materials to be used in the foundry industry. He was graduated from Princeton University in 1937 and then attended the International Geological Congress in Moscow. He returned to this country by way of the Pacific, spent some time in Manchuria and Japan, and then was made assistant geologist for the American Smelting & Refining Co. in Chihuahua, Santa Barbara and San Pedro, Mexico. In 1938 he entered the Colorado School of Mines, Golden, Colo., and was graduated in 1942 with the degrees of master in geological engineering and engineer of mines. He then became connected with the Wright Aeronautical Corp. as junior metallurgist and later took charge of the foundry sand laboratory which controlled core and mold sand mixtures for aluminum, magnesium, and bronze. In 1944 he was promoted to metallurgist and had control of the foundry practice unit of those foundries.

The Archer-Daniels-Midland Co., of which the Werner G. Smith Co. is a division, recently announced the formal opening of a modern central research laboratory at 38th Ave., S., Minneapolis. The new laboratory has over 40,000 sq ft of floor space. Individually controlled room air conditioning and modern types of equipment and scientific apparatus have been installed. Facilities of the laboratory will provide for greater research activity in the company's various products. Research work of the Werner G. Smith Co. will be located in the new facilities.



# Top Charging *with the Hydro-Arc Electric Furnace*

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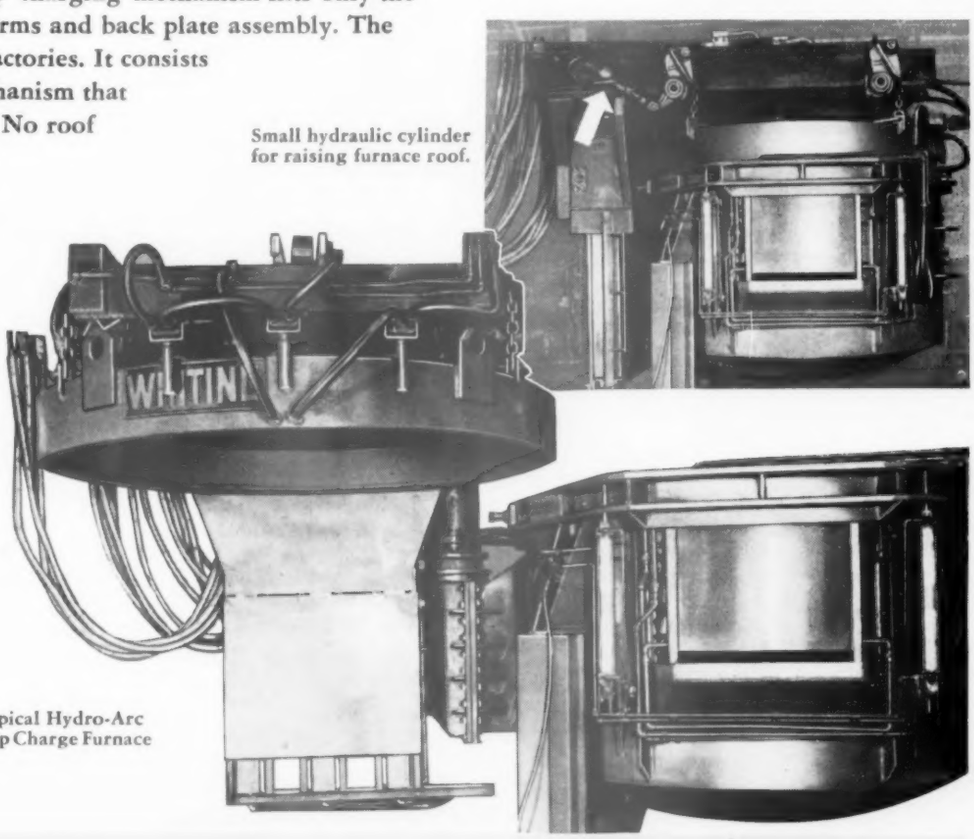
The Hydro-Arc top charging mechanism lifts only the furnace roof—not the arms and back plate assembly. The roof only rests on the refractories. It consists of a simple hydraulic mechanism that requires minimum service. No roof clamps are needed when the furnace is tilted. The foundations are as simple as those for a door charge furnace.

The top charge furnace is the most popular and economical type of electric furnace today. Power consumption is decreased and output increased. Full description of Hydro-Arc Furnaces given in Bulletin FY-130—write for a copy.



Small hydraulic cylinder for raising furnace roof.

Typical Hydro-Arc Top Charge Furnace

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# Electric Furnace Steel Group
## Studies Operating Problems

By EDWIN BREMER
*Metallurgical Editor*
THE FOUNDRY

AS Charles W. Briggs, Steel Founders' Society of America, and chairman of the committee for the Third Annual Conference on Electric Furnace Steel pointed out in his address of welcome, the conferences have passed through the organizational phases and have reached a majority. The 1945 conference, with nearly 500 in attendance, was held at Hotel Statler, Cleveland, on Dec. 4-5. Future meetings will be held during the first week in December to eliminate conflict with other organizational meetings.

Mr. Briggs stated that the electric furnace is becoming quite a factor in the production of steel, since 5,000,000 tons of electric furnace steel were made in 1945. Before the war about 25 per cent of the alloy steel was made by this method, but it now has risen to 34 per cent. In his response H. N. McQuaid, chairman of the Electric Furnace Steel Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers, said he believed that the electric furnace was just now coming into its own. In addition to its application for production of the highest quality steel and special metal, Mr. McQuaid expects the electric furnace to compete with the open-hearth furnace.

### Supplies Answer To Problem

Charles H. McCrea, National Malleable & Steel Castings Co., Cleveland, was toastmaster at the annual dinner held Tuesday evening. James F. Lincoln, Lincoln Electric Co., Cleveland, was the principal speaker, and stated that he believed that the answer to labor-management relations is an incentive system of management based fundamentally on the liberty of the individual.

Officers of the group appointed for the forthcoming year were chairman, W. J. Reagan, Copperweld Steel Co., Warren, O., and vice chairman, John B. Caine, Sawbrook Steel Castings Co., Lockland, O.

Opening technical session was a joint meeting of the acid and basic furnace divisions to consider the ideal conditions for fast melting. Chairman John Juppenlatz, Lebanon Steel Foundry, Lebanon, Pa., presided, with Henry C. Bigge, Bethlehem Steel Co., Bethlehem, Pa., co-chairman. First speaker was G. A. Barker Jr., Bethlehem Steel Co., who discussed preparation of scrap, with emphasis on economic factors. He pointed out that these involved the analysis, preparation for charging, and method of charging. Segregation of scrap permits recovery of alloys, removal of tramp elements such as tin and lead, and ability to avoid high incidental alloys in the final steel. Segregation mainly is accomplished by chemical analysis. Best procedure for turnings is to melt down a small batch and pour an ingot, which is analyzed. The spark and spot test of steels going into the charging buckets avoids bad heats. Method of analyzing bundled scrap is to open six bundles out of a carload, selecting a representative amount and melting it down as in the case of turnings.

CHARLES W. BRIGGS
*Chairman, Conference Committee*

Procedure to bring about rapid melting is to charge 50 per cent heavy scrap, 30 per cent medium scrap and 20 per cent light scrap. An excess over 10 per cent light, springy scrap will cause delays. Heavy scrap is placed around the electrodes to form a loose bed. It is covered by the medium scrap to provide many focal points for the arc to form liquid metal, and the light scrap on top melts rapidly and flows down to form a pool of liquid metal.

H. B. Schulz, Carnegie-Illinois Steel Corp., South Chicago, Ill., in discussing the problem said that except in the case of 18-8 steel, practice is to charge 50 per cent heavy scrap at the bottom, followed by medium and light scrap. With the stainless steel, light scrap is placed on the bottom, followed by heavy stainless scrap and ordinary plain steel scrap. When that is melted down the remainder of the light stainless scrap is added. In answer to a question on use of the light scrap at the bottom, Mr. Schulz said it is squeezed down by the heavy scrap, leaving room for the addition of more scrap.

Harry Walther, Timken Roller Bearing Co., Canton, O., pointed out that local conditions must be considered, since they determine the scrap available and charging procedure. At his plant materials are crane inspected by use of a magnet to catch any camouflage or upgrading. He also suggested watching for copper, since it often may be mistaken for steel. Harold Phelps, Rotary Electric Steel Co., Detroit, mentioned his plant's charges were composed of 50 per cent steel scrap 18 in. and under, 25 per cent No. 1 open hearth scrap, and 25 per cent return scrap. John Juppenlatz said requirements for scrap were that it be clean, free from oil, and smaller than 18 in. M. T. McDonough, National Malleable & Steel Castings Co., Sharon, Pa., stated his practice is to purchase plate scrap over ⅛-in. thick and not over 36-in. wide, a low phosphorus content.

### Coating Causes Trouble

Dale Hall, Oklahoma Steel Castings Co., Tulsa, Okla., mentioned that difficulty was encountered with sulphur in some heats which was traced to sulphur in the paint used on shells. As far as lead paint is concerned the only trouble is a health hazard in cutting the steel with oxyacetylene torches to reduce it to charging size. H. M. German, Driver-Harris Co., Harrison, N. J., called attention to the possibility of trouble with lead, tin and zinc in the manufacture of high-alloy steel of the heat and corrosion resistant type. Scrap should be dry and free from rust. Charles Locke, West Michigan Steel Foundry Co., Muskegon, Mich., said that porcelain-coated steel scrap content of the charge should be held low or difficulty will be encountered with a gummy, viscous slag, due to high feldspar content of the coating.

In a discussion of charging and recharging methods W. J. Reagan, Copperweld Steel Co., Warren, O., stated that in his plant the furnaces had 85,000 to 110,000 lb capacity and are top charged with buckets. A small amount of scrap

(*Continued on page* 152)

VANCORAM BRAND

# *Products for the Iron and Steel Industries*

| PRODUCT | NOMINAL COMPOSITION | APPLICATIONS |
|---|---|---|
| **ALSIFER** | Aluminum.....20%<br>Silicon.....40%<br>Iron.....40% | Used principally as a steel deoxidizer and for grain size control. |
| **FERRO CHROMIUM**<br>High Carbon Grade | Chromium...66-70%<br>Carbon..... 4-6% | For wrought constructional steels and steel and iron castings. |
| Iron Foundry Grade | Chromium...62-66%<br>Carbon.....4-6%<br>Silicon.....6-9% | For alloyed cast irons. Readily soluble as a ladle addition at the lower temperatures of cast iron. |
| Low Carbon Grades | Chromium...67-72%<br>Carbon...06%, .10%, .15%, .20%, .50%, 1.00% and 2.00% max. | For low carbon chromium steels, especially those with high chromium content, such as stainless and heat-resistant types. |
| **FERRO SILICON**<br>25-30% Grade | Silicon.....25-30% | Deoxidizer for open hearth steels; also for high silicon, corrosion-resistant iron castings. |
| 50% Grade | Silicon.....47-52% | Used as a deoxidizer and for the addition of silicon to high silicon steels, for springs, electrical sheets, etc. Pulverized form used as ladle addition to cast irons for silicon content and graphitization control. |
| 75% Grade | Silicon.....74-79% | For high content silicon steels, such as spring steels, sheets and forgings of high magnetic qualities for electrical apparatus. |
| High Silicon Grades<br>80-85%<br>85-90%<br>90-95% | <br>Silicon.....80-84.9%<br>Silicon.....85-89.9%<br>Silicon.....90-95% | For high content silicon steels where small ladle additions are used for required silicon content. Also for manufacture of hydrogen by reaction with caustic soda and production of magnesium by the Pidgeon process. |
| **FERRO TITANIUM**<br>High Carbon Grade | Titanium....15-18%<br>Carbon.....6-8% | Final ladle addition to control "rimming" action and to clean effervescing steel. Final deoxidizer and scavenger for steel castings and fully killed ingot steels. |
| Medium Carbon Grade | Titanium....17-21%<br>Carbon.....3-4.50% | Often preferred to the High Carbon Grade as a final ladle addition to very low carbon rimming or effervescing steels. |
| Low Carbon Grades<br>20-25% Ti Grade | Titanium....20-25%<br>Carbon..Max. 0.10%<br>Silicon.....Max. 4%<br>Aluminum Max. 3.50% | As a carbide stabilizer in high chromium corrosion resistant steels of extremely low aluminum content. Deoxidizer for some casting and forging steels. |
| 40% Ti Grade | Titanium....38-43%<br>Carbon..Max. 0.10%<br>Silicon.....Max. 4%<br>Aluminum..Max. 8% | As a carbide stabilizer in high chromium corrosion resistant steels, where smaller ladle additions are desired and extremely low aluminum content is not essential. |
| **VANADIUM METAL**<br>90% Grade | Vanadium....91.15%<br>Aluminum.....3.87%<br>Silicon.....0.50%<br>Carbon.....0.17% | For special iron-free (nonferrous) or low iron alloys or low impurity ferrous alloys. |
| 95% Grade | Vanadium....95.18%<br>Aluminum.....2.00%<br>Silicon.....0.27%<br>Carbon.....0.15% | Principally for research on the properties of pure alloys. |

| PRODUCT | NOMINAL COMPOSITION | APPLICATIONS |
|---|---|---|
| **FERRO VANADIUM**<br>Grade "A"<br>(Open Hearth) | Vanadium...35-40%<br>Silicon....Max. 12%<br>Carbon..Max. 3.50% | For low percentage vanadium content of rolled, forged or cast constructional steels. Also used in vanadium cast irons. |
| Grade "B"<br>(Crucible) | Vanadium...35-45%<br>Silicon..Max. 3.50%<br>Carbon..Max. 0.50% | For tool steels and special steels containing high percentages of vanadium, in which required limits for carbon and silicon are narrow |
| Grade "C"<br>(Primos) | Vanadium...35-45%<br>Silicon..Max. 1.25%<br>Carbon..Max. 0.20% | For tool steels and special steels requiring high percentages of vanadium and exceptionally low carbon and silicon content. |
| Special Grades | Vanadium...50-55%<br>60-65%<br>70-80%<br>Silicon.....Low<br>Carbon.....Low | For special applications and uses requiring large vanadium additions. |
| **VANADIUM PENTOXIDE**<br>Technical Grade<br>Fused Form | $V_2O_5$.....80% | A source of vanadium in basic electric furnace steels. A base for numerous chemical compounds. |
| Technical Grade<br>Air Dried Form | $V_2O_5$.....85% | A base for preparation of numerous chemical compounds, such as catalysts, etc. |
| **GRAINAL ALLOYS**<br>Vanadium Grainal<br>No. 1 | Vanadium....25.00%<br>Aluminum....10.00%<br>Titanium.....15.00%<br>Boron.....0.20% | Practical and economical intensifiers for controlling and increasing the capacity of steels to harden, and for improving other important engineering and physical properties. |
| Vanadium Grainal<br>No. 6 | Vanadium....13.00%<br>Aluminum....12.00%<br>Titanium.....20.00%<br>Boron.....0.20% | See above. |
| Grainal No. 79 | Aluminum....13.00%<br>Titanium.....20.00%<br>Zirconium.....4.00%<br>Manganese....8.00%<br>Boron.....0.50%<br>Silicon.....5.00% | See above. |
| **GRAPHIDOX No. 4** | Silicon.....45-50%<br>Titanium.....9-11%<br>Calcium..... 5-8% | New alloy for the graphitization of iron; ladle treatment insures iron with normal graphite, free from dendritic structure; reduces chill; efficient inoculant in the production of high strength irons. |
| **V-FOUNDRY ALLOYS**<br>V-5 Grade | Chromium....38-42%<br>Silicon.....14-16%<br>Manganese....8-11% | Used in cast irons as a ladle addition. Reduces chill, promotes uniformity of structure, increases strength and hardness. |
| V-7 Grade | Chromium....28-32%<br>Silicon.....15-21%<br>Manganese...14-16% | See above. |
| **BRIQUETTES**<br>Ferro Chromium | Hexagonal in shape. Weighs approximately 3¾ pounds and contains 2 pounds of chromium. | A practical and convenient form for adding ferro alloys to the cupola. |
| Ferro Silicon | Two sizes available, both cylindrical in form, one containing 1 pound of silicon; the other 2 pounds of silicon. | See above. |


VANADIUM CORPORATION OF AMERICA

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is placed on the bottom of the furnaces by a magnet to act as a cushion. Buckets hold from 35,000 to 40,000 lb. Where scrap is voluminous, recharging is necessary after meltdown to load the furnace to capacity. A. K. Blough, Republic Steel Corp., Canton, O., pointed out that proper shaping up of the charge in the furnace aids rapid melting. Chrome-free scrap melts faster than that containing chromium, and turnings slow down melting if too much is used. Steep banks without a shelf permit the scrap to drop quicker into the bath than when the wall is more sloping. Mr. Blough also pointed out that rate of power input into the furnace must be balanced against cost and tonnage desired.

Alex Texter, Atlas Steels Ltd., Welland, Ont., stated that in his plant the furnaces are top charged and the charges drop 10 ft. Time required is 15 minutes from power off to power on. Recharging after meltdown is accomplished with a charging machine operating through the side door. Scrap used with the machine must not be too long, and not too much heavy scrap is used because it drops to the bottom of the bath and chills it. R. H. Frank, Bonney-Floyd Co., Columbus, O., described the three methods of charging small electric furnaces such as employed in the steel foundry. These include hand, chute and top charging. He said that in chute charging the placement of materials is important to get the proper disposal in the furnace. Since the furnace must be tilted the tendency is for all the material to be loaded into the front of the furnace. Hence, care must be exercised in the order in which the heavy and light materials are charged.

### Use Low Power Input

C. W. Briggs spoke briefly on information gathered in Germany on electric furnace practice. Procedure was to use 100 per cent light scrap and rotate the furnace horizontally through a 30° angle by manual operation. Furnaces also were rocked or tipped back and forth. Large electrodes of the Soderburg type made on the premises were employed. In commenting on that practice Samuel Arnold 3rd, American Bridge Co., Pittsburgh, said that horizontal oscillation of the furnace is not new. It was employed by Germans because the furnace did not use as much power as is employed in this country. Rotation or oscillation was necessary to obtain electrode area for melting.

Harry Walther, Timken Roller Bearing Co., in describing results with rotary electrode control, said that 5 kwh per ton and 5 per cent overall time were saved, and that as experience is gained, he believes further savings will be made by use of that type of control. He also advised the installation of graph meters on all furnaces to get a record of power consumption during the heat as an additional method of control. W. J. Reagan said that a study of 300 heats involving the old contact type and new rotary electrode control equipment showed a decrease in melting time for the latter from power on to finish slag for gross time only, and no delays. For 154 heats with the old control the average time was 3 hours 44 minutes while with the rotary control for 146 heats the time was 3 hours 26 minutes. From tap to tap, including all delays, a comparison of 105 heats with contact control showed the average time was 4 hours 31 minutes, while with the rotary control on 281 heats the average time was 4 hours 8 minutes. Also with rotary electrode control there was a power reduction of 2½ per cent and electrode consumption reduction of 5½ per cent. No improvement was noted in wall or roof life.

**W. J. REAGAN**
*New Chairman, Conference Committee*

M. J. Meinen, Crucible Steel Co. of America, Midland, Pa., mentioned a saving of 5 minutes, 1 per cent in power, and 1 per cent in electrode consumption. In making stainless steel a lower pick-up of carbon was noted. T. H. Burke, Otis Elevator Co., Buffalo, N. Y., stated that with the rotary electrode control a saving of 8 or 9 per cent time; 5 to 6 per cent in power, and in electrode consumption was obtained. Control of the furnace was fast and accurate, and power surges were reduced. In a written discussion H. A. Dempsey, Crucible Steel Co. of America, mentioned a 26 per cent longer lining life, a saving of time and power, and lower electrode breakage. Clyde Wyman, Burnside Steel Foundry Co., Chicago, said he found a 6 per cent saving in power with the rotary control, as well as a saving in time which permitted picking up one heat in an 18-hr operating period. A decrease of 7 per cent in power demand rate was secured.

The afternoon sessions were divided into basic and acid practice discussions. That on acid practice was devoted to furnace and ladle linings under the direction of Chairman C. C. Spencer, Electric Steel Castings Co., Indianapolis, and Co-Chairman R. P. Heuer, General Refractories Co., Philadelphia. First speaker, C. P. Grigsby, General Refractories Co., stated that silica brick was preferred for acid lining because of its resistance to FeO and to thermal spalling at high temperature. To improve service life an expansion of 1/8 to 3/16-in. per ft during construction should be allowed. Preheating of linings by oil or gas flames previous to application of electric power will aid in reducing spalling when bringing up to operating temperature. Temperature of silica brick should not be allowed to drop below 550 F on shutdowns.

C. D. Sellers, Detroit Steel Casting Co., Detroit, pointed out that furnace lining life will depend on the type, kind of scrap and its arrangement, type of steel being made and cooling conditions. With a 1½-ton electric furnace, silica brick was found preferable. For heats of ordinary size 13½-in. brick were used, while with large heats and bulky scrap 11½-in. were employed. To obtain a high slag line 9-in. brick with a 2-in. ganister mix rammed between furnace shell and silica brick were used. Power input should be held down until the electrodes bore into the charge. Alloy steels are harder on refractories due to slower melting. Coolers on door jambs and roof glands reduce refractory wear.

### Favor Ganister Lining

John B. Caine discussed the use of rammed ganister furnace linings. In his foundry they have been found economical due to the high temperatures employed. Practice was to get the steel as hot as possible in the shortest time, and tap. Ganister mixture used is composed of 65 per cent ganister ⅜-in. down, 31 per cent furnace bottom sand, and 4 per cent fireclay with 1 gal glutrin per 100 lb for moisture. C. E. Bales, Ironton Fire Brick Co., Ironton, O., spoke on rammed ganister linings and stated that rammed sidewalls show a 25 per cent better life than silica brick. Mixture for ramming is composed of 60 per cent siliceous ramming refractory, and 40 per cent sized ganister (¼ to 1/16-in.) which are thoroughly mixed in the dry state and then 4 per cent moisture is added, followed by further mixing. Mixture is applied in 4-in. layers rammed to 2½ in. Lining is dried by slowly heating. Bottoms may be rammed with the same type mix except for the substitution of 3/8 to 1/8-in. sized ganister. C. W. Briggs described use of Krupp rings in

(*Continued on page* 154)

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THE WHEELS OF INDUSTRY

(*Continued from page* 152)

German steel furnaces. These are cast steel hollow rings, water-cooled, and placed in the roof around the electrodes. Longer roof life was obtained—from 25 to 150 heats—but it was pointed out that German refractories are poor compared with ours.

In a discussion of basic linings I. W. Sharp, American Steel Foundries, Verona, Pa., said that he found the basic process slightly cheaper than the acid process. K. T. Apgar, Taylor-Wharton Iron & Steel Co., High Bridge, N. J., stated that in a 5-ton basic furnace 3000 heats had been obtained on one bottom. C. W. Briggs mentioned that in basic practice in Germany the bottoms and sidewalls were formed of a dolomite-tar mixture rammed into place on magnesite brick. Bottoms are 16 to 20 in. thick and the sidewalls are 10 to 12 in. thick.

### Describe Ladle Lining Practice

I. W. Sharp stated that top pour ladles in his plant are lined with 9 x 9 x 1-in. brick. H. C. BeMent, Campbell, Wyant & Cannon Foundry Co., Muskegon, Mich., said his ladles of the cylindrical, insulated type contain linings rammed by hand. They have a capacity of 600 lb and a life from 72 to 144 tons. C. B. Jenni, General Steel Castings Corp., Eddystone, Pa., stated that bottom-pour ladles have a life of 60 to 75 heats when carefully lined, dried and preheated. Best combination is a graphite-clay stopper and a fireclay nozzle, with the latter somewhat softer than the former. Leaky nozzles and stoppers must be closed off immediately by application of firm, high pressure, otherwise they get beyond control. T. H. Burke, Otis Elevator Co., Buffalo, described a surface coating for brick ladle linings which he claimed extended the life to 100 to 150 heats, the coating being removed every 10 to 15 heats and a new one applied. Mixture consists of 25 per cent ganister, 20 per cent fireclay and 55 per cent crushed silica rock. Materials are mixed dry and then water is added. After further mixing Mexican graphite is added. Coating is applied about 1 in. thick. Procedures for lining teapot ladles were described by James A. Bowers, American Cast Iron Pipe Co., Birmingham, Ala., and Edward M. Sarraf, Harbison-Walker Refractories Co., Cleveland, O.

First session Wednesday morning comprised a joint meeting of the acid and basic groups at which new methods of temperature measurement were discussed. Chairman was R. B. Sosman, U. S. Steel Corp., Kearney, N. J. First speaker, H. T. Clarke, Jones & Laughlin Steel Corp., Pittsburgh, described various methods for determining temperature of molten iron and steel by immersion type instruments. These included the graphite-tungsten, graphite-silicon carbide, platinum-rhodium thermocouple type, and various photoelectric cell type units. The latter are focused on a quartz, closed-end tube immersed in the molten metal to give black-body optical conditions. K. L. Clark, Naval Research Laboratory, Anacostia, Md., stated that at the laboratory optical type immersion instruments were used with success. With iron and steel the immersion tube is quartz, while with nonferrous metals the tube is graphite. Approximately 10 to 15 seconds are required for the determination, and the cost is about $1 per reading.

J. S. Marsh, Bethlehem Steel Corp., Bethlehem, Pa., stated that various types of instruments had been tried with more or less success, but his opinion was that the problem of molten metal temperature measurement is far from solution. What really is needed is a simple, foolproof instrument which can be handled by the first helper on the open-hearth furnace. R. B. Sosman described an instrument devised and used successfully by engineers of the firm with which he is associated. It is of the photocell type with the cell focused at the end of an open steel tube through which compressed air is blown. In reply to a question on the possibility of the tube welding shut or burning off due to the high temperature, Mr. Sosman stated that the time of immersion is so short that the tube hardly has time to get hot enough. However, if slag is not present, there is a possibility that welding might occur.

### Discuss Silicon-Killed Steel

Second session on acid practice was concerned with operations, under Chairman Charles Locke, West Michigan Steel Co., Muskegon, Mich., and Co-Chairman E. H. Weak, American Steel Foundries, East Chicago, Ill. In a discussion of silicon-killed steel, Jerry Kanter, Crane Co., Chicago, pointed out that one of the reasons for the interest in that procedure, as compared with the usual method of killing with aluminum, is due to the belief that the latter tends to cause or is associated with graphitization of steel at temperatures of 900 to 950 F, with pressures of 1500 psi as found in public utility steam operations. Investigation indicates that aluminum promotes susceptibility toward graphitization, but use of 0.40 per cent Cr in aluminum-killed, C-Mo steel decreased that tendency.

M. F. Milligan, Lunkenheimer Co., Cincinnati, stated that results indicate silicon-killed or silicon-aluminum killed nickel-chromium-molybdenum (WC-4) steel shows no tendency to graphitize. With some other steels suitable for high temperature steam service, the silicon-killed type are more resistant to graphitization tendency than silicon-aluminum killed. John B. Caine stated that adjustments of electric furnace conditions for silicon killing can be made by control of the slag. With 8 per cent FeO in the slag the steel can be poured in dry sand, but the FeO content has to be reduced to 5 per cent for pouring in green sand. To get low FeO content in the slag, as many as six slag changes may have to be made. Slag color is a good indicator of composition as at about 5 per cent FeO content, the slag has a jade green color all the way from exterior to interior.

### Hold Slag in Furnace

E. C. Troy, Dodge Steel Co., Philadelphia, suggested that with all the difficulty in reducing the FeO content of the slag to a low figure by numerous slag changes, it would be much easier to hold the slag in the furnace and tap the steel into a clean ladle where the addition of ferrosilicon for killing could be made. Comments indicated it is difficult to hold the slag in the furnace and tap out only the steel. John Juppenlatz said he was not quite sure that aluminum is the culprit in the case of graphitization. Aluminum is present in ferrosilicon as well as in the slag and lining. When the FeO content of the slag gets low there is a possibility of reduction of aluminum and perhaps silicon. What is needed is an accurate method for determining the aluminum in steel. He also stated that he believed the best solution for the tendency toward graphitization in carbon-molybdenum steels is to use additional alloys such as chromium and nickel.

Clarence Lorig, Battelle Memorial Institute, Columbus, O., read a paper on the causes and prevention of intergranular, or so-called rock-candy, fracture in cast steel. Prime cause was aluminum nitride precipitation at primary grain boundaries. Ferrite precipitation as a net work on the primary grain boundaries caused intergranular fracture in as-cast specimens, but the network was obliterated by heat treatment. Other suspected causes included carbide precipitation at primary grain boundaries, extreme case of network-sulphide inclusions, internal hot tears, and a chain-like precipitate of some unidentified compound. Prevention of aluminum nitride precipitation is by judicious use of aluminum in deoxidation, and a low nitrogen content. Ferrite precipitation can be controlled by raising or lowering the hardenability, or the cooling rate after solidification.

Wednesday afternoon session was devoted to a discussion of fluidity and temperature, with E. C. Troy, Dodge Steel Co., Philadelphia., as chairman, and F. B. Eiseman, Ross-Meehan Foundries, Chattanooga, Tenn., co-chairman. Session opened with a written discussion by Howard Taylor, Massachusetts Institute

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*Ransohoff*

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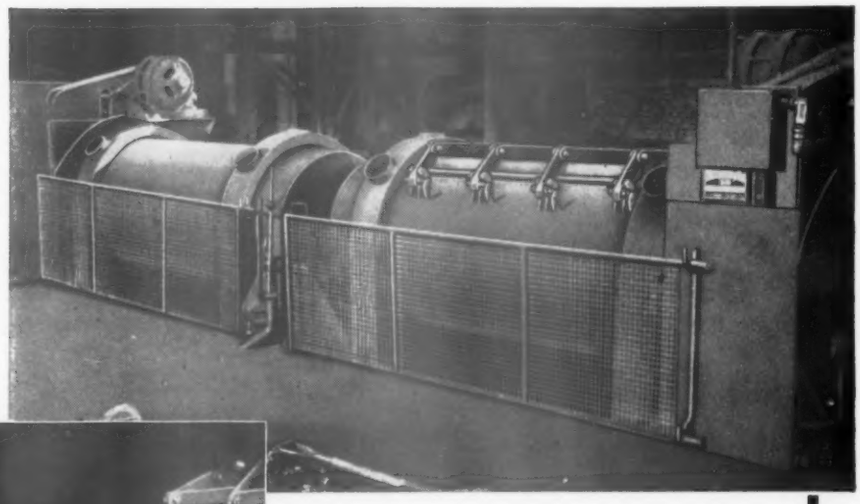

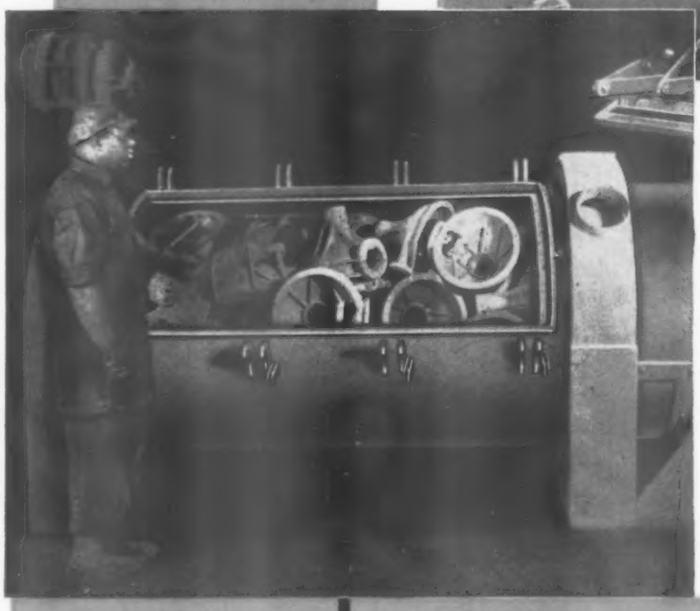

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## THE FOUNDRY DATA SHEET — JANUARY, 1946

# A GLOSSARY OF TERMS EMPLOYED IN THE FOUNDRY

(Continued from December, 1945)

BRAIDED STRAW ROPE—Rope made of straw to wrap on a core barrel.

BRANCH CORE—Part of a core assembly.

BRANCH GATE—Two or more gates leading into the casting cavity.

BREAST—Area surrounding the taphole of a melting furnace.

BREEZE—Coke or coal screenings.

BRICK—Blocks of hard-burned clay or the materials used in construction. May be refractory or non-refractory.

BRIDGE—Material adhering to the cupola wall which slows or prevents descent of the stock charges.

BRINELL HARDNESS—Value of hardness of a metal or alloy, tested by measuring the diameter of an impression made by a ball of given diameter applied under a known load. Values are expressed in brinell hardness numbers.

BRIQUETS—Compact cylindrical or other shaped blocks formed of finely divided materials by incorporation of a binder, by pressure, or both. Materials may be ferroalloys, metal borings or chips, silicon carbide, etc.

BRIQUETTING MACHINERY—A machine used to make briquets.

BUCKET—A vessel such as a tub, scoop, etc., for hoisting or conveying materials. Types include elevator, clam shell, dragline, grab, loading, dumping, etc.

BUG—Colloquial term for imperfection.

BULB SPONGE—Rubber ball with a small piece of sponge inserted in the hole.

BUMPER—Machine for ramming sand in a flask by repeated jarring or jolting action.

BUNG—Section of the removable roof of an air or reverberatory furnace. Also used to indicate choking or plugging up.

BUILT-UP PLATE—A pattern plate with the cope pattern mounted or attached to one side with the drag on the other. See matchplate.

BURNER—A device which mixes fuel and air intimately to provide perfect combustion when the mixture is burned. Types include acetylene, oil, gas, powdered coal, stoker, etc.

BUSHING—A sleeve metallic or nonmetallic, usually removable or replacable which is placed in a body to resist wear, erosion, etc.

BUTT RAMMER—The flat end of the molder's rammer.

CALCIUM BORIDE—An alloy of calcium and boron corresponding when pure to the formula $CaB_6$ containing about 61 per cent boron and 39 per cent calcium, and used in deoxidation and degasification of nonferrous metals and alloys.

CALCIUM CARBIDE—A grayish-black, hard crystalline substance made in the electric furnace by fusing lime and coke. Addition of water to calcium carbide forms acetylene (see which) and a residue of slaked lime.

CALCIUM-ALUMINUM-SILICON—An alloy composed of 10 to 14 per cent calcium, 8 to 12 per cent aluminum and 50 to 53 per cent silicon used for degasifying and deoxidizing steel.

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This is the second installment of an extensive glossary of foundry terms compiled by Edwin Bremer from a wide variety of sources. In the development of this material a great amount of help has been secured from the *Steel Castings Handbook* published by the Steel Founders' Society of America, Cleveland; *American Malleable Iron* published by the Malleable Founders' Society, Cleveland, and from unpublished work of a Committee on Foundry Nomenclature of the American Foundrymen's Association, Chicago. THE FOUNDRY wishes to thank all sources from which this material has been obtained.

THE EDITORS

CALCIUM-MANGANESE-SILICON—An alloy containing 17 to 19 per cent calcium, 8 to 10 per cent manganese, 55 to 60 per cent silicon and 10 to 14 per cent iron used as a scavenger for oxides, gases and non-metallic impurities in steel.

CALCIUM MOLYBDATE—A crushed product containing 40 to 50 per cent molybdenum, 23 to 25 per cent lime, 3 per cent iron max., and 5 to 10 per cent silica used to add molybdenum to iron and steel produced in the open hearth, air furnace or electric furnace.

CALCIUM SILICON—An alloy of calcium, silicon and iron containing 28 to 35 per cent calcium, 60 to 65 per cent silicon, and 6 per cent iron maximum used as a deoxidizer and degasifier for steel and cast iron. Sometimes called calcium silicide.

CAR (CHARGING)—Conveys materials to the melting unit or furnace.

CAR (TRANSFER)—Car serves several tracks.

CARBIDE—A compound of carbon with a more positive element such as iron. Carbon unites with iron to form iron carbide or cementite, $Fe_3C$.

CARBON STEEL—Steel which owes its properties chiefly to various percentages of carbon without substantial amounts of other alloying elements; also known as ordinary steel or straight carbon or plain carbon steel.

CARBURIZING—Adding carbon to the surface of iron-base alloys by heating the metal below its melting point while in contact with carbonaceous solids, liquids, or gases.

CARD OF PATTERNS—A number of patterns fastened together.

CASE HARDENING—Carburizing and subsequent hardening by suitable heat treatment of all or part of the surface of a structure composed of an iron-base alloy.

CASSETTE, X-RAY—A frame used to hold sensitized film during radiographic examination.

CASTING (NOUN)—Metal poured into a mold to form an object.

CASTING (VERB)—Act of pouring molten metal into a mold.

CASTING, DIE (VERB)—Pouring molten metal under pressure into a metal mold.

CASTING, MACHINE (VERB)—Process of casting by machine.

CASTING, OPEN SAND (NOUN)—Casting poured into an uncovered mold.

CASTING STRAINS—Strains resulting from internal stresses created during cooling of a casting.

CAST-WELD ASSEMBLY—Welding one casting to another to form a complete assembly.

CAST PLATE—Metal plate, usually aluminum, cast with the cope pattern on one side and the drag pattern on the other. See matchplate.

CEMENT, METALLIC—Finely divided metal or alloy combined with a water-soluble binder which hardens shortly after addition of water to form a hard compact mass, and used to fill slight surface defects where no stress occurs.

CEMENT, REFRACTORY—Highly refractory material in paste or dry form ready to be mixed with water which may be used as a mortar, a patching material, or to form a complete lining in a furnace or other unit where high temperatures are encountered.

CEMENTITE—Iron carbide, $Fe_3C$, a hard brittle crystalline compound observed in the microstructure of iron-base alloys.

CENTRIFUGAL CASTING—Process of filling molds by pouring the metal into a sand or metal mold revolving about either its horizontal or vertical axis, or pouring the metal into a mold that subsequently is revolved before solidification of

# A GLOSSARY OF TERMS EMPLOYED IN THE FOUNDRY

the metal is complete. Molten metal is moved from the center of the mold to the periphery by centrifugal action.

CHAPLET—A metallic insert or support to hold a core in position in the mold.

CHAPLET, CURVED—A chaplet with a curved face.

CHAPLET, DOUBLE HEAD—A chaplet with a bearing plate at each end.

CHAPLET, FLAT—A chaplet with a straight face.

CHAPLET, PERFORATED—A chaplet made from tin-coated sheet metal punched full of small holes, and bent to shape.

CHAPLET, RADIATOR—Special design of chaplet first used in making cast iron radiators.

CHAPLET, SHELL—A cup-shape chaplet.

CHAPLET, SINGLE HEAD—A chaplet with a bearing plate at only one end.

CHAPLET, STOVE—Special chaplets used in making stove parts.

CHAPLET, STRAIGHT—See chaplet, flat.

CHAPLET, STUD—A solid block chaplet or one with a bearing plate at each end.

CHARCOAL (PIG) IRON—Pig iron reduced in a blast furnace using charcoal as the fuel.

CHARGING CRANE—System for charging the melting furnace with a crane.

CHARGING DOOR—Opening through which the furnace is charged.

CHARGING FLOOR—Floor from which the furnace is charged.

CHARGING MACHINE—Machine for charging the furnace, particularly the open hearth.

CHARGING OPENING—See charging door.

CHARGING PLATFORM—See charging floor.

CHARGING SHEET—Record of material charged into the furnace.

CHEEK—Intermediate sections of a flask inserted between cope and drag. Necessitated by difficulty of molding unusual shapes, or in cases where more than one parting line is required.

CHILL (VERB)—To cool rapidly.

CHILL (NOUN)—A metal object placed on the outside or inside of a mold cavity to induce more rapid cooling at that point.

CHILL COATING—A material applied to metal chills to prevent oxidation or other deterioration of the surface which might result in blows when molten metal comes in contact with the chills.

CHILL COILS—Chills made of steel wire formed into helical coils or spirals.

CHILL NAILS—Chills in the form of nails.

CHILL OIL—See chill coating.

CHIP (VERB)—To remove extraneous metal from a casting with hand or pneumatically operated chisels.

CHIPPING HAMMER—Hand pneumatically operated hammer to chip metal from casting.

CHUCK—A small bar between the long bars in a flask. Also a holding device on machine tools and other equipment.

CHURN—Moving a metal rod up and down in the riser of a large casting to prevent freezing over the top.

CLAMP—A device for holding parts of a mold, flask, corebox, etc. together.

CLAY BOND—See binder.

CLAY WASH—Clay and water mixed to a creamy consistency.

CLAY, REFRACTORY—A clay which in addition to its capability to resist high temperatures also possesses strong bonding power.

COAL DUST—See sea coal.

COERCIVE FORCE—Magnetizing force applied in a reverse direction to a magnetized body to remove the residual magnetism.

COHESION—Force by which particles are held together. Varies with different metals and alloys, and depends on hot or cold working as well as upon molecular arrangement due to heat treatment.

COINING—Process of forming metals by pressing them to size and to very close tolerances.

COKE—A porous, gray infusible product resulting from the dry distillation of bituminous coal which drives off the volatile matter. Used as a fuel in cupola melting. Petroleum coke results from distillation of petroleum, and pitch coke from distillation of coal tar pitch.

COKE BED—First layer of coke placed in the cupola. Also the coke used as the foundation in constructing a large mold in a flask or pit.

COLD BLAST PIG IRON—Pig iron produced in a blast furnace without the use of the heated air blast.

COLD SHORTNESS—Brittleness when metal is at a low temperature.

COLD SHUT—Where two streams of metal do not unit thoroughly in a casting.

COLD WORKING—Permanent deformation of a metal below its recrystallization temperature.

COLLECTOR, DUST—See arrestor, dust.

COMBINED CARBON—The carbon in iron or steel combined with other elements and therefore not in the free state as graphite or temper carbon.

COMPOSITE CONSTRUCTION—Welding a steel casting to a rolled or forged steel object to form a complete assembly. See also cast-weld assembly.

CONTINUOUS ANNEALING FURNACE—Furnace in which castings are annealed or heat treated by passing through different zones kept at constant temperatures.

CONTROL SYSTEMS, DUST—See arrestors, dust.

CONVEYOR—A mechanical apparatus for carrying or transporting materials from place to place. Types including apron, belt, chain, gravity, rollers, monorail, overhead, pneumatic, vibrating, etc.

CONVERTER—Vessel for refining molten metal by blowing air through it. Used in making steel from molten cast iron and in refining copper.

COPE—The upper or topmost section of a flask, mold or pattern.

CORE—A separable part of the mold, usually made of sand and generally baked, to create openings and various shaped cavities in the casting.

CORE BAR—A piece of iron or steel to strengthen a core.

CORE BARREL—Pipe shaped device upon which a cylindrical core is formed.

CORE BINDER—Any material used to hold the grains of core sand together.

CORE BLOWING MACHINE—Machine which rams the core by blowing sand into the corebox.

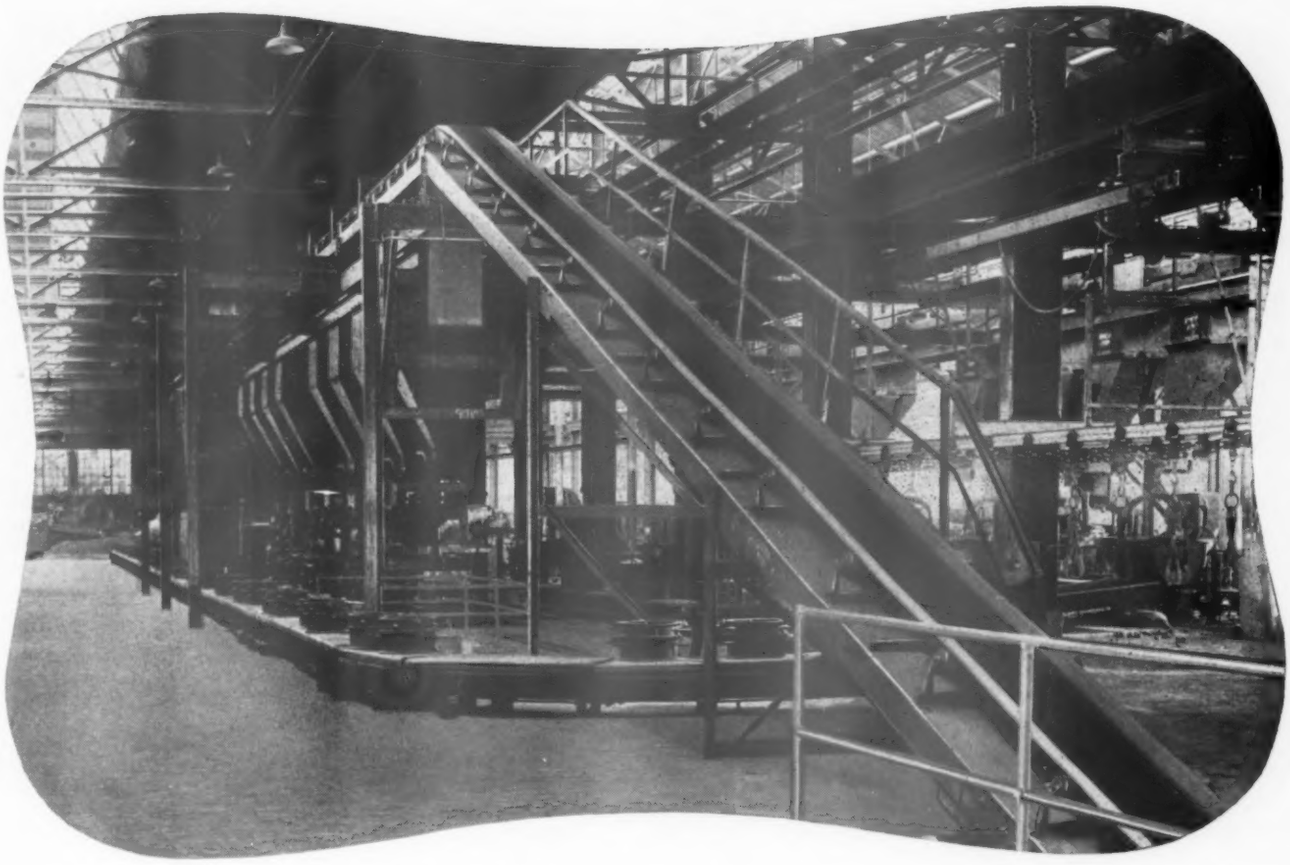
COREBOX—Box with an opening in which the core is formed.

CORE BREAKER—A machine for crushing cores or for removing cores from castings.

CORE COMPOUND—See core binder.

CORE DRIER (DRYER)—Sand or metal supports to keep cores in shape during baking.

(To Be Continued)



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**FOUNDRY SAND, MOLD AND CASTINGS HANDLING**

# Industry BRIEFS

INTERNATIONAL Harvester Co., Chicago, has purchased from RFC, acting as agent for the Surplus Property Administration, the plant in Melrose Park, Ill., which Buick Division of General Motors Corp. operated during the war for the manufacture of airplane engines, and will convert it for occupancy by its industrial power division. Price paid was $13,750,000.

Major operations to be centered in the Melrose Park plant will be production of diesel engines, this to be shifted from Harvester's Milwaukee works. Company's program also calls for complete mechanization and expansion of the gray iron foundry in Milwaukee. This plant will originate many of the key components, such as castings, forgings and gears going into crawler tractors and other power units.

• • •

Great Lakes Founders & Machine Corp., Ludington, Mich., has been formed for the founding and machining of light gray iron castings. Raymond E. Gilbert and Donald B. Birtwistle, formerly associated with Campbell, Wyant & Cannon Foundry Co., Muskegon, Mich., and Theodore Miller, until recently connected with Detroit Diesel Engine Division of General Motors Corp., organized the new corporation.

• • •

October sales of foundry equipment represented 457.8 per cent of the 1937-1939 monthly average, according to the Foundry Equipment Manufacturers Association. This was a decrease compared with 577.2 per cent for September and 526.5 for October, 1944, but was higher than seven of the preceding 12 months.

• • •

Pittsburgh Equitable Meter Co. has changed its name to Rockwell Mfg. Co., and will be continued as a subsidiary of the parent company, operating plants located in Pittsburgh, Brooklyn, N. Y., and Hopewell, N. J.

• • •

Furnace Foundry Co., Jackson, O., a subsidiary of Armstrong Furnace Co., Columbus, O., plans construction of a foundry in the former city, to cost $150,000.

• • •

Manning, Maxwell & Moore Inc. shortly will move the sales department for its Hancock products from Bridgeport, Conn., to Watertown, Mass., where its new plant is now being completed for increased production of valves, inspirators, injectors and ejectors. M. S. Palmer is department manager.

• • •

Haupt Foundry, Huntsville, Ala., idle more than two years, is resuming operations under the management of E. S. Elkins, College Park, Md., to produce gray iron, brass and aluminum castings.

• • •

Damage estimated by company officials at $10,000 was suffered by Newman Bros. Inc., Cincinnati, through a roof fire which resulted in flooding of the four-story plant and basement.

• • •

Modern Foundry & Mfg. Co., Mascoutah, Ill., a new company organized for the production of gray iron castings, will occupy a new foundry building 60 x 342 ft, to cost approximately $50,000. Equipment for operations is expected to cost approximately $35,000.

• • •

Anchor Foundry Corp., Cleveland, plans construction of a gray iron foundry, with capacity of six to eight tons daily. Philip B. Andell, associated with Gluntz Brass & Aluminum Foundry, Cleveland, and Leo J. Kucera, attorney, Bedford, O., are members of the new corporation.

• • •

Hines Flask Co. plans construction of a one-story plant in West 140th St., near Triskett Rd., Cleveland, to cover 25,000 sq ft.

• • •

Doehler-Jarvis Corp., New York, plans construction of a steel and concrete plant at Grand Rapids, Mich., to cost about $250,000, and a one and two-story die casting building and compressor room at Toledo, O., to cost about $350,000.

• • •

American Brake Shoe Co., New York, has let contract for a one-story foundry, 58 x 60 ft, at Meadowlands, Pa.

• • •

Zelis Foundry Co. is the firm name under which Christopher L. Zelis has published a certificate that he is conducting business at 1651 Compton Ave., Los Angeles.

• • •

Victor Foundry Co. is the firm name under which Robert H. Pilkington and John H. Mann have published a certificate that they are conducting business at 2820 North Alameda St., Compton, Calif.

• • •

Mission Pattern Shop is the firm name under which Harold Behee has published a certificate that he is conducting a foundry pattern business at 5526 Alhambra Ave., Los Angeles.

• • •

Johnson Foundry & Machine Co., Los Angeles, has been incorporated with $100,000 capital. Directors include C. L. Tanner, Los Angeles, Louis J. Smith, Torrance, Calif., and Herbert G. Bley, Beverly Hills, Calif.

• • •

National Radiator Co., Johnstown, Pa., plans construction of a one-story foundry addition, 50 x 220 ft at New Castle, Pa., to cost about $65,000.

• • •

Century Foundry & Engineering Co., Greenfield, Wis., has been incorporated by Frank J. Balcerzack, 207 East Michigan St., Milwaukee, to manufacture iron, steel and metal products.

• • •

Clinton Foundry Co., Clinton, Mich., has been incorporated with $25,000 capital to operate a foundry and machine shop, by Donald Thomas.

• • •

William Z. Taylor Inc., 644 Morgan Ave., Brooklyn, N. Y. plans construction of a foundry and office building, 200 x 510 ft, to cost about $225,000.

• • •

Brunt Mfg. Co., Horicon, Wis., plans construction of a one-story reinforced concrete foundry addition to cost about $60,000.

• • •

Armory Foundry Co., 380 Armory St., Jamaica Plain, Boston, plans construction of a one-story foundry building, to cost about $45,000.

• • •

Production Foundries Inc., 1601 South Hanna St., Fort Wayne, Ind., has been incorporated with 1000 shares no-par value to operate a foundry, by Robert R. Keeton and associates.

• • •

T. J. O'Hara plans construction of a new foundry and machine shop, 50 x 130 ft, at 2428 East 55th St., Huntington Park, Los Angeles, to cost $13,000.

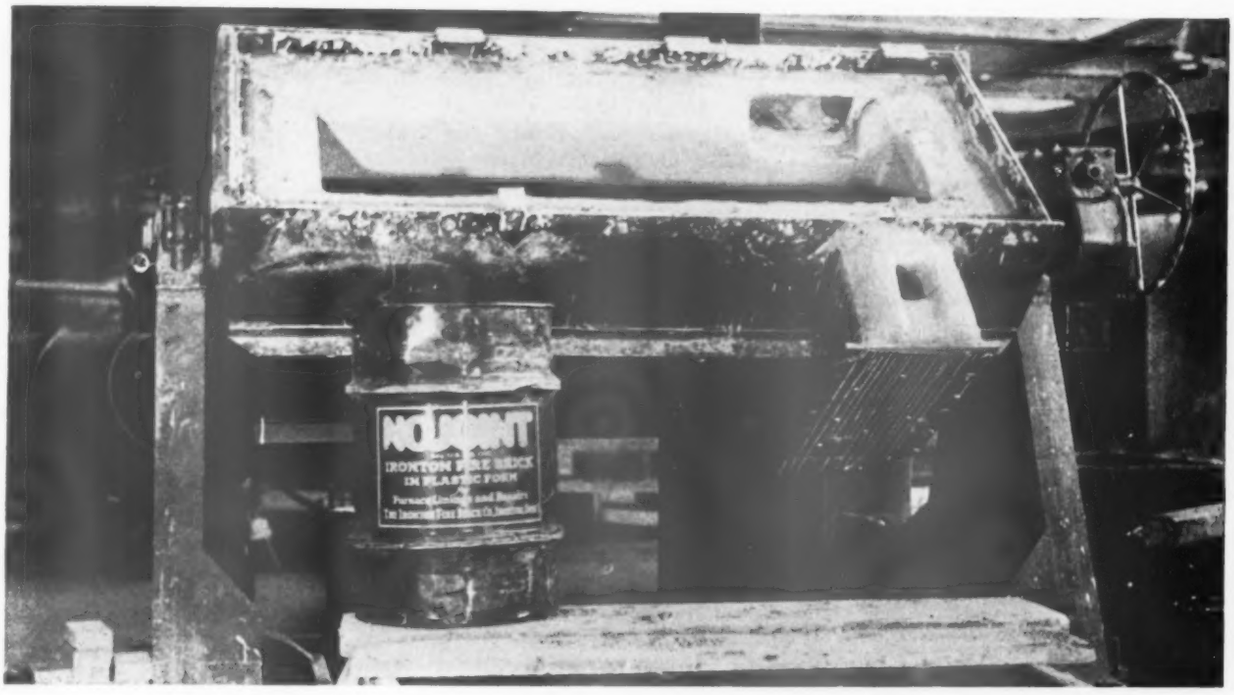
• • •

A new molding room is being erected at the foundry of the Mir-O-Col Alloy Co., 2416-2426 East 53rd St., Los Angeles, 55 x 85 ft, to cost $5000.

• • •

Rockford Engineering & Testing Laboratories, Rockford, Ill., are liquidating their business and are starting a gray iron foundry at Riverlane road, Rockford.

# "IRONTON NOJOINT" for Foundry Ladles




"Ironton Nojoint", a special type of plastic ramming refractory, is giving excellent service in forehearths, mixing ladles and desulphurizing ladles where fused soda ash is used. It lasts much longer than regular fire brick or special shapes because the solid, dense, monolithic lining of "Ironton Nojoint" is free of joints and is highly resistant to alkaline slags.

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RELIABLE REFRACTORIES

IRONTON OHIO

# GRAY IRON ACCEPTANCE BROADENS

(*Continued from page* 75)

work. For example, the cupola still remains supreme in the melting field; but improvements have been made in many cases (1) by the adoption of cupola air-furnace duplex units (two of the automotive shops), (2) an increase in the number of hot-blast cupolas, (3) an increase in the number of balanced-blast cupolas, and (4) a large increase in control equipment such as blast control, temperature control, and humidity control.

As far as the metallurgy of the iron is concerned, most of the changes have resulted from an increased awareness of the metallurgical possibilities of cast iron and the resulting increase in the amount of research work being done by the industry, both by individual concerns and by co-operative groups such as the Gray Iron Research Institute Inc. The upper limit of tensile strength of gray cast irons has been extended to 100,000 psi. Materials in this range have not found widespread uses as yet, but the generally accepted prewar limit of 60,000 psi has been exceeded many times and for many routine applications.

Among the interesting applications of cast irons developed or receiving widespread publicity and increased use during the war period have been (1) cast iron crankshafts in all sizes, (2) high-pressure gray iron castings, (3) high-strength valve bodies and valve castings (such as found in the widely publicized "Big-Inch" oil line), (4) centrifugally cast sleeves and liners, (5) high-strength piston rings, (6) composite-metal castings, (7) porous chromium-plated parts of various types for wear-resistant applications, and (8) high-carbon, low-silicon alloyed iron for wear and heat-shock-resistant applications. The technical development which made these applications possible also made possible further improvements in cast iron metallurgy and foundry practice during the postwar period.

Little change occurred in the specialized technique of permanent mold castings during the wartime period in this country. However, one organization in England installed six American-designed and American-engineered permanent mold casting machines under the direct supervision and with the co-operation of American industry. These units were then used in England for the production of gray cast iron shells, incendiary bombs, fuze bodies, and other military applications connected with the war effort.

Specialized technique of centrifugal and centrifuged cast parts in gray cast iron has received some publicity, and actually there was more development along this line than is publicly known. The most widely known applications during the war include diesel liners and sleeves together with some pot-cast piston rings. It is not possible to predict, at the present time, how much of this capacity will remain during the postwar period or how much it will be increased. Many problems have been connected with some of these applications, and the industry is still in the process of developing its technique. Centrifugal casting of parts such as pipe and tubing was, of course, a prewar development, but during the wartime period the effort was intensified and the technological advances became quite marked.

### Practice Closer Control

As far as the metallurgical thinking of the industry is concerned, the emphasis seems to be toward more development of special high-carbon, low-silicon alloyed iron and to increased control over melting and inoculation processes. There have been a few developments of super high-strength irons, at least as far as the patent stage, but the greater interest is in closer control and more reproducible properties in the range from 30,000 to 70,000 psi tensile strength. The literature of the industry has included many developments on scientific gating and molding, while the AFA committee work has been most active concerning cupola operation, casting defects, chill test and other control methods, inoculation, and specifications and engineering properties. There has been a definite increase in the knowledge of the effect of cooling rates, section size, and the application of sound metallurgical principles to both production and utilization of iron castings.

Prewar emphasis on low-carbon cast irons seems to be replaced by more interest in the possibilities of higher carbon contents with sufficient alloy to maintain fine graphite. Many irons containing up to 4.0 per cent carbon have been developed for wear-resistant applications, particularly when the wear is such as to involve rapid heating and cooling, or when accompanied by conditions of heat-shock. These developments have already been examined for their postwar possibilities, and many designing engineers will be specifying these high-carbon, 40,000 psi tensile strength irons for their peacetime products.

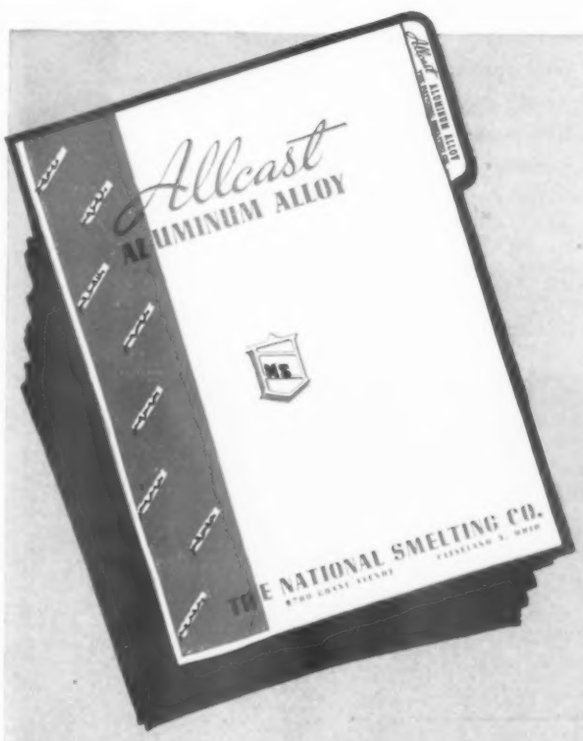
**INVOLVES NEW FOUNDRY:** International Harvester Co. has started construction at Wood River, Ill., of a new $47 million plant, incorporating a large gray iron foundry, to provide manufacturing facilities for small tractors, including this recently announced 10-hp Farmall Cub weighing only 1050 lb. This smallest of tractors is intended to give complete, low-cost mechanization to small-acreage farmers. Selling price will be about $400, or around $1000 with a full complement of implements

**Sources of Illustrations**

Fig. 1—Cooper-Bessemer Corp., Mt. Vernon, O., and Grove City, Pa., and International Nickel Co. Inc., New York.

(*Concluded on page* 165)

# Announcing Allcast
## ALUMINUM ALLOY

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Because of its adaptability to a wide variety of applications, Allcast can be used successfully on a large number of aluminum casting requirements. This fact, combined with the substantial savings it affords, makes Allcast worthy of the attention of every foundry and manufacturer who will not sacrifice quality, but who nevertheless must remain competitive.

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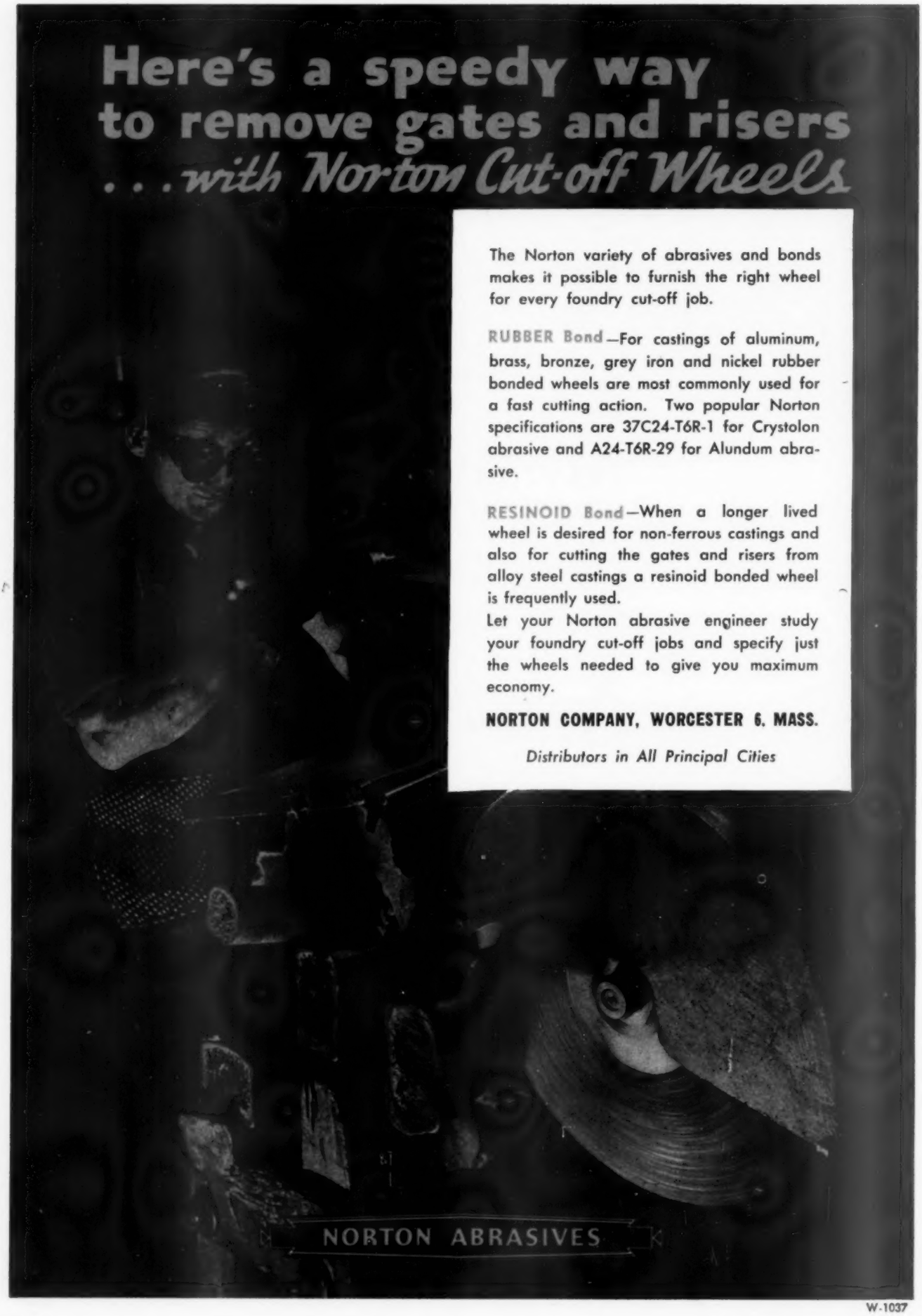
**NATIONAL SMELTING**

# Here's a speedy way to remove gates and risers ...with Norton Cut-off Wheels




The Norton variety of abrasives and bonds makes it possible to furnish the right wheel for every foundry cut-off job.

RUBBER Bond—For castings of aluminum, brass, bronze, grey iron and nickel rubber bonded wheels are most commonly used for a fast cutting action. Two popular Norton specifications are 37C24-T6R-1 for Crystolon abrasive and A24-T6R-29 for Alundum abrasive.

RESINOID Bond—When a longer lived wheel is desired for non-ferrous castings and also for cutting the gates and risers from alloy steel castings a resinoid bonded wheel is frequently used.

Let your Norton abrasive engineer study your foundry cut-off jobs and specify just the wheels needed to give you maximum economy.

**NORTON COMPANY, WORCESTER 6, MASS.**

*Distributors in All Principal Cities*

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(*Concluded from page* 162)

Figs. 2, 3, 5, 7, 11, 12, 13, 14—National Engineering Co., Chicago.

Fig. 4—Darling Valve & Mfg. Co., Williamsport, Pa., and International Nickel Co. Inc., New York.

Figs. 6, 8—Whiting Corp., Harvey, Ill.

Fig. 9—Worthington Pump & Machinery Corp., Harrison, N. J., and Whiting Corp., Harvey, Ill.

Fig. 10—International Nickel Co. Inc., New York.

# ALUMINUM FOUNDRIES RAISE CASTING QUALITY

(*Continued from page* 86)

by the uninitiated, excellent results can be obtained once the technique has been mastered. The principal disadvantage of this alloy is the adverse effect on ductility produced by exposure to moderate temperatures.

The aluminum-zinc-magnesium casting alloys are characterized by good properties in the as-cast condition, very marked room-temperature age hardening following the casting operation. When of high purity, they have good resistance to corrosion, but they are subject to moderate hot shortness. As the iron and/or silicon content is increased, the resistance to corrosion is maintained, the tensile properties, particularly the elongation values, decrease, and the alloy becomes less hot short.

### Alloys Resist Corrosion

The all-purpose alloy for high-strength castings has been the aluminum-silicon-magnesium type. This class of alloys is represented by Alcoa 355 and 356 alloys and by the European alloy containing 9 per cent Si, 0.25 per cent Mg, and 0.25 per cent Mn, and/or cobalt. These alloys are characterized by good resistance to corrosion, good tensile properties when heat treated, and very good foundry characteristics. They tend to age at room temperature, and after several months or years, the elongation becomes quite low with a corresponding increase in yield strength and hardness.

Existence of large quantities of scrap have, of course, brought secondary alloy compositions to the fore. Practically all of the low-grade secondary alloys are copper-sillicon alloys with low magnesium content, but with liberal amounts of other impurities, particularly iron. These alloys generally have good foundry characteristics, and when the copper content is 4 per cent or higher, are amenable to heat treatment. Their resistance to corrosion is lower than that of the aluminum-magnesium-silicon alloys, and they tend to have lower tensile properties.

Inspection by the foundry and buyer, always of great importance in foundry operations, occupied a very responsible position during wartime. Much has been written and a great deal has been said, a considerable portion of which is unprintable, about foundry inspection. The outstanding development in foundry inspection concerned the training of personnel.

The ideal foundry inspector is a foundryman with the attributes of a machinist, a metallurgist, a patternmaker, a diplomat, and a jack-of-all-trades. Though all foundry inspectors, at the end of the war, did not meet this description, it may be concluded that the war period ended with each foundry well equipped with a capable inspection organization. Like other metallurgical industries, the inspection organization in aluminum foundries is needlessly plagued with a multiplicity of poorly written specifications. It is unfortunate that more progress has not been made in the direction of standardization and clarification.

The inspection department has had the benefit of further development of old inspection devices and the introduction of some new ones. Radiography has been widely applied and has made a considerable contribution to the improvement of the general quality of aluminum castings. It is unfortunate, however, that x-ray laboratories have not had the benefit of more foundry experience. Also, there has been an unfortunate trend in overselling radiography, since some of the most enthusiastic promoters fail to realize that inferior castings can be and are given a clean bill of health by the x-ray. It is unfortunate also that more progress has not been made in the identification of the defects revealed by x-ray. It is the duty of the x-ray laboratory as part of the inspection department to identify properly the cause of the defect so that the foundry operators can combat the difficulty intelligently.

Fluoroscopic inspection has had wider use. This method of inspection is cheaper than radiography, but it is less sensitive. However, it has considerable usefulness as a rapid means of detecting the larger and more obvious types of defects which may occur in the castings.

### Use Black Light Inspection

The so-called "black light" inspection has had some application during the war period. By this method of inspection, the casting is immersed and soaked for several minutes in a special oil having fluorescent properties. The casting is then washed thoroughly in hot water, dried, and dusted with chalk or similar powder. The fluorescent oil in the surface defects is then absorbed by the chalk. When the casting is viewed under ultraviolet light, the fluorescent oil marks the position of the defects which reach the surface of the casting. It is obvious only those defects which reach the surface of the casting will be revealed by this method of inspection. Since it is characteristic of castings to have many, but harmless surface defects, this method of inspection must be used with care. However, it has its place as a nondestructive method of inspection, and it is particularly useful for the identification and location of cracks.

Microradiography has been developed to produce a fairly useful tool. This

**VERSATILE TRUCK: While normally used for carrying and stacking loads within the plant, the versatile fork truck can be used for many other practical jobs. Here, for example, a high lift fork truck is employed to put a safe sturdy platform aloft for linemen to install flood lights to illuminate a loading area. The truck shown is made by Clark Tructractor, Battle Creek, Mich.**

method of inspection is applied to very thin sections of the metal being investigated. Therefore, it is akin to, and may be supplementary of, micrographical examination. Short-cut methods of applying microradiography have been recommended, but these should be regarded with caution. In general, very careful technique is required if the method is to provide useful information.

During the past five years, the art of making aluminum permanent-mold castings and their acceptance and use have progressed markedly. The production of permanent-mold and semipermanent-mold castings has expanded enormously, the general quality improved, and castings of greatly increased size and complexity have been produced successfully. The demand for a large number of parts has made it possible to extend the permanent-mold method to many castings, thereby taking advantage of the improved mechanical properties, reduction in cost, and improved dimensional accuracy.

The die-casting procedure also has received considerable impetus during the war, and because of the desirable properties of aluminum die castings, they rapidly have assumed a much greater importance in this field. The development of the high-pressure, cold-chamber type of die-casting machine has been largely responsible for the progress in and the wide acceptance of aluminum die castings.

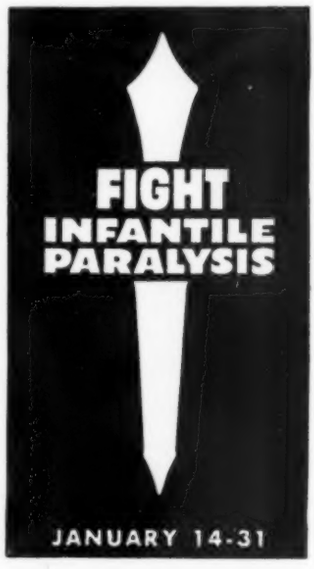
### Still in Experimental Stage

The centrifugal casting process for aluminum is not yet out of the experimental stage, although considerable interest has been shown in the application of this process to aluminum. At the present stage of development, it appears that the method has some promise, but further experimental work is required.

Use of plaster molds and cores has increased considerably during the war period. It is well known that this method of casting produces the finish and dimensional accuracy normally obtained in metal molds, but the tooling costs are much lower. The procedure is probably not a low-cost, high-production method of casting, but it has been used successfully for the production of aluminum alloy engine castings. Aluminum patterns are not recommended, but brass, wood, or rubber patterns may be used, the latter having the advantage that back drafts and undercuts can be used without the necessity of loose pieces. Excellent metallurgical quality apparently has been obtained, but it is likely that further attention should be given to certain metallurgical characteristics which arise from the slow solidification rate.

The precision-casting or lost-wax method has received a great deal of attention during the war, and it has been very useful for the production of certain high-melting-point alloy parts requiring high dimensional accuracy but which are difficult to machine. The process has been described in many current articles, and it is sufficient to point out here that the precision-casting method is applicable to aluminum alloys where high dimensional accuracy is required without a machining operation. The process is a high-cost one suited to highly specialized applications only.

The use of cement in foundry molding has had considerable application in both the United States and England for the production of the castings of the higher-melting-point alloys. The process, however, has not had much application in aluminum foundries.




Unquestionably, improvements have been made in the standard melting equipment which still consists of a reverbatory furnace for alloying and pot-type stationary or tilting furnaces for remelting prior to casting. The reverbatory furnace is the most economical method of melting from the standpoint of cost per pound melted, but the contact of the products of combustion with the metal is not generally considered good practice when melting preparatory to casting. Where careful temperature control is used and the maximum temperature is kept low, the reverberatory furnace may deliver reasonably good quality metal in the final melting operation. Some attempts have been made to construct a silicon carbide muffle over the melt to prevent the contact of the metal bath with the products of combustion.

An adaptation of the low-frequency electric brass-melting furnace has been introduced for aluminum melting. The principal changes which have been made, aside from those in the electrical mechanism, consist of an increase in the section area of the melting channels. Otherwise, these channels tend to be plugged by the dross which is formed. Special clean-out openings also are required. These low-frequency induction furnaces are now employed, at least on a limited commercial basis, in this country. Because of the principle of melting used, these furnaces deliver melts of good quality. However, they have the disadvantage of requiring continuous operation and the first cost is high. High-frequency furnaces have been given less attention than the low-frequency furnaces. The high-frequency furnace does not suffer from the disadvantages of dross accumulations and the operation need not be continuous. Again, the high first cost will retard the development of this type of furnace in the aluminum foundries. Induction furnaces, however, have made a start, and they undoubtedly will play an effective role at least in special melting operations.

### Overexpansion May Be Handicap

Now that the war is over, the wartime developments are important only insofar as they affect the future of the industry. By way of a summary it should be noted that the overexpansion may be something of a handicap to the aluminum foundry industry. On the other side of the ledger, however, there are (1) a reduction in the prewar price of aluminum primary ingot, (2) an abundance of cheap, good-quality secondary metal, (3) improved plant equipment and more modern foundry layout, (4) a widespread expansion in technical "know how" in the aluminum foundry industry, (5) a light-metal-conscious public expecting the use of light alloys in the products which they purchase, and (6) marked technological advances which generally have raised the quality of aluminum castings, thereby extending their uses and winning the confidence of the users.

After reconversion is well under way, the aluminum foundries should find the thread dropped prior to the war. Growth in the industry then will come from supplying old markets with a better and cheaper product and the creation of new and larger markets by the development of new applications and by technological advancement.

#### Sources of Illustrations

Figs. 1, 2—OEM photos by Palmer.

Figs. 3, 4, 5, 6, 7, 8, 9—Delco-Remy Division, General Motors Corp., Detroit.

Fig. 10—Caterpillar Tractor Co., Peoria, Ill.

Fig. 11—Aluminum Co. of America, Pittsburgh.

Fig. 12—Dodge Chicago Plant, Division of Chrysler Corp., Detroit.

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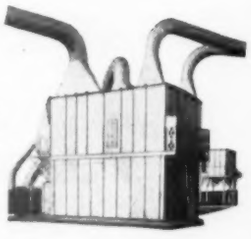

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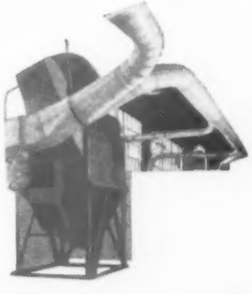

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# Activities of foundry GROUPS

## Central Ohio

ABOUT 85 members and guests of the Central Ohio Chapter of the AFA met for dinner at the Fort Hayes Hotel, Columbus, O., Nov. 26. After dinner the group divided for three round-table discussions, each led by a member of the chapter.

The subject common to all three groups was "Coreroom Practice" and the separate discussions were led by K. G. Presser, chief metallurgist, the National Supply Co., Springfield, O., on gray iron; Delmar S. Kolleda, Commercial Steel Casting Co., Marion, O., on steel; and W. R. Huffman, plant manager, H. B. Salter Mfg. Co., Marysville, O., on nonferrous. A lively interchange of ideas and opinions was reported in all groups.

N. J. Dunbeck, co-chairman of the chapter, who presided at the general meeting after dinner, announced that the round-table discussions were an experiment and their continuation was subject to approval of the members. He solicited opinions of the members and it is planned to have two more meetings devoted to this type of discussion in the 1945-46 season.—M. B. Millar.

## Detroit

ANALYSIS of quality control and specifications in the gray iron and malleable castings field was presented to the Detroit Chapter, Nov. 15, by Hy Bornstein, director of testing and research laboratories, Deere & Co., Moline, Ill., marking the first time he had appeared before Detroit foundrymen in five years. A capacity crowd of 150 jammed the meeting room to hear his address.

He covered the development of general specifications such as are used by ASTM and SAE and then devoted some time to special specifications for particular applications. He emphasized the need for close co-operation between purchasing agents, inspectors, engineering departments and foundries, calling attention to the fact allegedly defective castings are not always the sole fault of their producer.

In touching on quality control methods, Mr. Bornstein evoked from the audience an opinion that quality control is really the responsibility of the entire foundry organization, from president on down to laborer. It is often impractical if not impossible for a single quality control man to effect much improvement without the entire producing organization being conscious itself of quality control.

No regular chapter meeting was held in December. Instead, the first "Alumni Reunion" of former chapter officers and directors was scheduled for Hotel Statler, Dec. 18. Invitations were extended to all men in the Detroit area who had been at one time or another associated with affairs of the Detroit Chapter, AFA, or its predecessor, the Detroit Foundrymen's association. The event was strictly social in character and was expected to be the forerunner of annual gatherings of its type. —*Arthur H. Allen.*

## Eastern Canada and Newfoundland

A SPECIAL meeting of the Eastern Canada and Newfoundland Chapter of the AFA, held Nov. 2 at the Technical School in Quebec City, was presented in French. The committee in charge included D. A. Allard, chairman, Ed Laurendeau, Henri Louette and Emile Drolet. Robert Bernard, past chapter chairman, acted as honorary chairman. At the afternoon session, Mr. Louette presented Philippe Methe, director of the Technical School, and a tour was conducted through the shops of the school.

E. C. Winsborrow, vice president, Shawinigan Foundries Ltd. then addressed the group, giving technical advice to young foundrymen of the school. Emile Drolet, president, F. X. Drolet Ltd., presented an interesting talk on metallurgy, followed by Mr. Allard who explained the aims of the arts and trades schools in the province, in broadening technical education. The group then adjourned to the shops of the F. X. Drolet Co. for a plant tour.

After an excellent dinner in a French dining room, the group re-assembled in the school lecture hall. Speaker of the evening was Henri Louette, superintendent, Warden King Ltd., who discussed foundry sands, illustrating his talk with diagrams and actual performances of many of the tests used in sand evaluation. Question and answer period followed.

Robert Bernard, member of the provincial parliament for Drummond County, congratulated the chapter on the success of its first all-French meeting and promised to secure all the government support possible to further foundry education through technical schools. Chapter Chairman Ewing Tait closed the meeting which was voted a successful experiment for French-speaking members and students of the Technical School.

Regular monthly meeting of the chapter held Nov. 9 at the Mount Royal Hotel, Montreal, featured individual group discussions. The iron and steel groups, under the chairmanship of J. Grieve, combined forces. Discussion leaders were J. McVey, Jenkins Bros. Ltd., who discussed "Production Methods," and E. Turner, Lynn MacLeod Metallurgy Ltd., whose subject was "Steel Foundry Technology." The nonferrous group convened under the chairmanship of A. J. Moore, Montreal Bronze Ltd. Discussion leaders were Marc Chicoine, Robert Mitchell Co. Ltd., who chose "Melting and Alloying," as the subject of his talk, and H. J. Roast, Canadian Bronze Co. Ltd., outlining, "Special Casting Problems."

During the discussion which followed many important points were brought out with regard to charge makeup and melting atmospheres, as well as the solution of difficult casting problems by introducing centrifugal casting methods. A miscellaneous group meeting, under the direction of A. E. Cartwright, Robert Mitchell Co. Ltd., discussed, "Salvage and Repair of Castings." A. E. Speck, Dominion Oxygen Co. Ltd., assisted Mr. Cartwright in explaining how progress that has been made in welding now makes possible the reclaiming of castings which otherwise would be scrapped.—*G. D. Turnbull, chairman, publicity committee.*

## Birmingham

J ARTHUR WOODY, chairman of Birmingham District Chapter of the AFA, loosed both barrels, so to speak, when he presided at the first meeting of the winter season in Birmingham, Oct. 26, at the Tutwiler Hotel.

Eighty-five members were present for the dinner and heard Col. John E. Getzen, district chief, Birmingham Ordnance District, discuss "The Part the Foundry Industry Played in the War Effort." Colonel Getzen was introduced by W. D. Moore, president, the American Cast Iron Pipe Co. Colonel Getzen enumerated the large number of items furnished through the Birmingham Ordnance District, many of which were named for the first time because of the secrecy connected with their manufacture. Colonel Getzen expressed great appreciation and praise for the accomplishments of district foundrymen in meeting the needs of the Ordnance Department.

(*Continued on page* 170)

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**17 BATTERY PLACE**
**NEW YORK 4, N. Y.**

(*Continued from page* 168)

J. A. Bowers, chairman of the program committee, introduced James S. Vanick, metallurgist, International Nickel Co., New York, as the speaker for the technical session. The latter gave a most interesting and enlightening talk on "New Horizons for Cast Iron." After his talk he presented a number of slides showing the results of experiments already under way. His interpretation of the charts, diagrams and pictures shown made this meeting one of the best the chapter has experienced.

At a meeting of the officers and directors prior to the dinner it was voted to promote a Birmingham District Foundrymen's Conference in Birmingham on Feb. 14, 15, 16. Outstanding speakers and roundtable discussions on subjects vital to foundrymen will feature the meeting. A banquet on Friday evening will climax the meeting with a special plant visitation program scheduled for Saturday. Charles Saunders, entertainment committee chairman, will be in charge of arrangements.—*J. P. McClendon, publicity director.*

## Cincinnati

AN INTERESTING presentation, "X-ray As Applied to the Foundry Industry," was offered by Dr. Scott W. Smith for the enlightenment and entertainment of approximately 75 members of the Cincinnati District Chapter of the AFA, Nov. 12, at the headquarters of the Engineering Society. Vice Chairman Joseph Schumacher presided at the dinner meeting, and after the showing of an illustrative technicolor film, "Carbon—Black Treasure," Hiram Brown introduced the speaker.

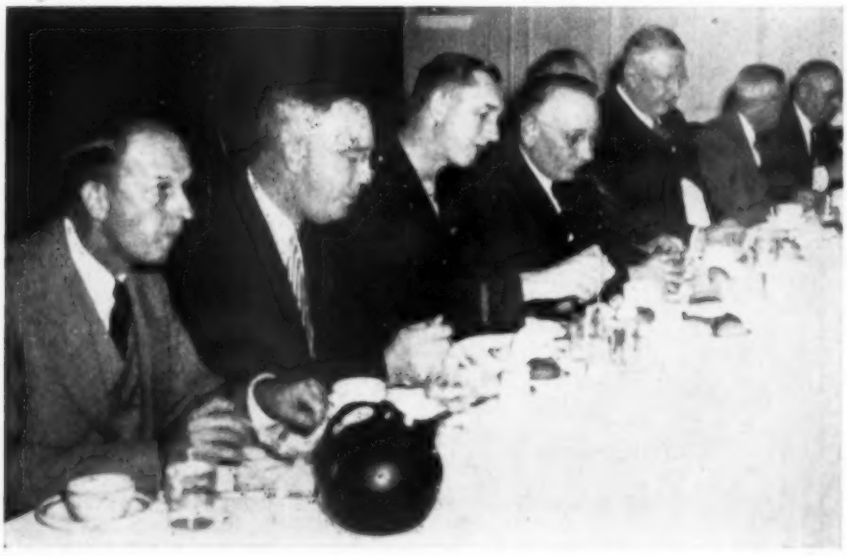
Dr. Smith, physicist at the Kelley-Koett Mfg. Co., Covington, Ky., discussed the discovery and development of x-ray and brought out in an instructive manner practical applications of radiography and fluoroscopy in the examination of nonferrous and light-section ferrous castings. Technical considerations of penetrating power, voltage and film exposure factors were also described.—*William H. Hoppenjans Jr., secretary.*

## Toledo

TOLEDO Chapter of the AFA, with co-operation of national officers of the association, played host to representatives of the top management of foundries in the Toledo area, at a luncheon in the Commodore Hotel, Nov. 30. Present to greet the visitors were three of the national officers: Fred Walls, president; William Maloney, executive secretary; and Ralph Rycroft, a director. All three gave short talks, explaining various activities of the national association, and asked management to offer suggestions and criticism of its activities in management's behalf. A lively discussion period followed which proved of great benefit to all.

The dinner meeting that evening was well attended and featured Lester B. Knight, of L. B. Knight & Associates, Chicago. In a straight-forward talk, Mr. Knight presented his views on "Modernization of the Foundry." Pointing out that modern thinking is needed more than modern equipment, Mr. Knight blamed the foundrymen themselves for much of the trouble they have been experiencing. For profitable operation of the foundry he maintained, first, that the superintendent should be surrounded with a specialized staff of assistants, capable of establishing and maintaining control of all foundry procedures; second, that more emphasis should be placed on regulating foundry costs to insure profitable operation; and third, that modernized equipment should be added to lower costs and improve working conditions. Mr. Knight stated that improved equipment should always be tailored to fit the pocketbook.

The speaker felt that most foundries have been lax in sales engineering, and should insist that customers furnish them with proper pattern equipment to do the job. He stressed the fact that too many foundries still accept jobs on which they know they cannot make a profit, rather than offend the customer. The talk was illustrated with numerous slides. The spirited discussion period which followed the talk was an indication of the interest shown.—*R. B. Bunting, publicity chairman.*



**BIRMINGHAM: Seated at speakers' table at recentt meeting of Birmingham District Chapter, AFA, are, left to right: T. H. Benners, vice chairman; James A. Bowers, program committee chairman; Col. J. E. Getzen, Birmingham Ordnance District chief; J. Arthur Woody, chairman; James S. Vanick, International Nickel Co. Inc., New York; W. D. Moore; Joseph T. Gilbert, director; Fred K. Brown, secretary-treasurer**

## Twin City

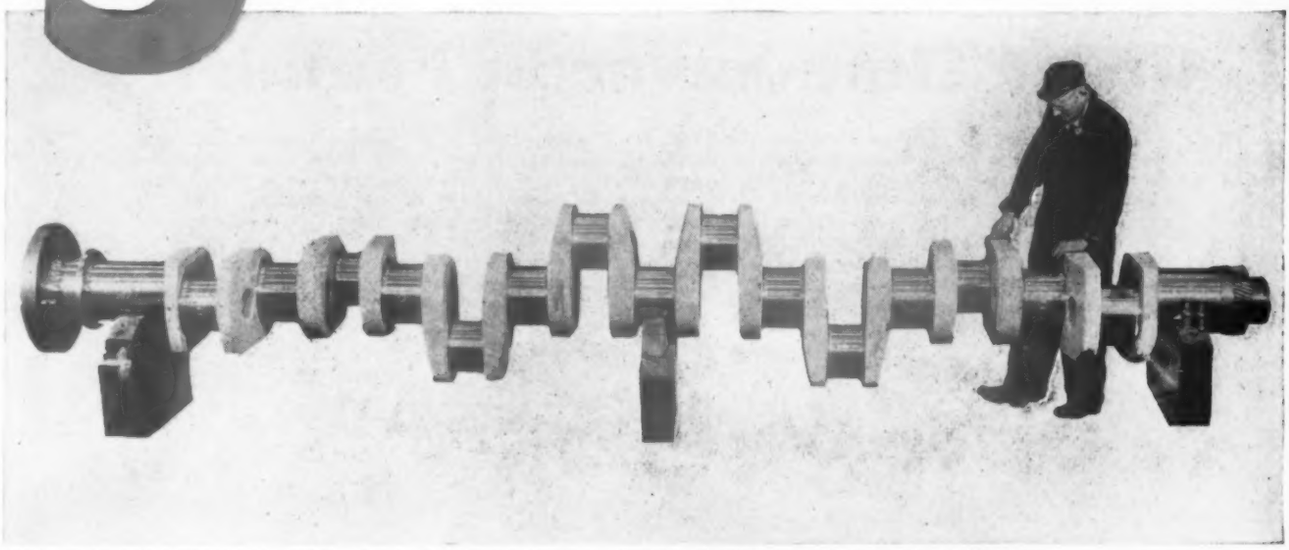
ANCIENT history was unveiled at the October meeting of the Twin City Chapter of the AFA by Bruce L. Simpson, president, National Engineering Co., Chicago, when he presented an illustrated talk on "The History of the Foundry Industry."

Claims that our industry is one of the oldest known to man were ably proved by Mr. Simpson by tracing its origin to 4000 B.C. when copper was being cast for weapons, using clay and sandstone as mold materials. Cast iron was the first developed in China about 2000 B. C., using stone for molds, and Chinese are credited with pouring the largest single casting ever made about 502 A.D. Cast steel was developed in India. The Egyptians developed the lost wax-process of molding, and cores were developed originally to save metal, not for internal shaping.

Progress was stopped for several centuries during the Dark Ages in Europe, although some work was done by the monasteries to acquaint people with foundry practice. Molten iron came into use about 1200 A.D. and loam molding appeared around 1300 A.D. Around 1700 A.D. progress again appeared in discovering new metal techniques and methods of melting and molding. Metallurgical analysis was started approximately 1700 A.D., and also the

(*Continued on page* 173)

# 5 TONS OF PROOF



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(*Continued from page* 170)

sand molding method came into use with patterns for open type molds.

The first blast furnace in America was erected in Lynn, Mass., in 1622. At High Bridge, N. J., the Taylor-Wharton Iron and Steel Co. commenced making castings in 1742. The plant has been operated continuously up to the present. Several of the signers of our Declaration of Independence were well known foundrymen of their day.

Since the beginning of the 1800's foundry science has advanced rapidly. Developments include ladles, overhead conveyors, molding machines in 1837, sand mixers in 1880, and core baking in 1887. Foundry practice has advanced very rapidly since the middle eighties to its present state of mechanization and improved working conditions, and the rate of development shows no indication of slacking off.—*J. W. Costello.*

## Western New York

ROUNDTABLE discussions marked the Nov. 2 meeting of Western New York Chapter of the AFA at Hotel Touraine, Buffalo. Chapter Chairman Arthur H. Suckow presided.

Three groups assembled in separate rooms for the technical discussions. "Cupola Practice," was under the leadership of Carl A. Harmon, Hanna Furnace Corp. Mr. Harmon outlined the principal phases of the subject, from the selection of raw materials and methods of charging, to slagging and patching. Interest in this subject was indicated by the numerous questions asked and by the discussion which followed.

"Steel Foundry Melting Practice," was handled under the direction of Walter Crafts, Union Carbide & Carbon Research Laboratories. Discussion was invited on such subjects as metallic charge, slag practice and control, oxidation practice, deoxidation in the furnace and in the ladle.

Another group, under the chairmanship of Robert W. Molley, Foundry Metal Sales, discussed "Nonferrous Practice." This covered application of various alloys in aluminum castings and their effect on machinability, heat treating, and the practice of making pilot castings for large jobs.

These meetings invited a lively discussion, and it was felt that this informal method of breaking up the general meeting into specialized groups gives everyone an opportunity to secure full benefit from the subject in which he is most interested.

An added feature of the evening was an interesting talk by Max T. Ganzauge, General Railway Signal Co., Rochester, N. Y. Supplemented by pictures, Mr. Ganzauge covered the high lights of his observations in Germany where he was sent shortly after VE-Day by the Foreign Economic Administration to make a technical survey of foundry facilities and practices as developed in Germany during the war.—*Leo A. Merryman, secretary.*

## St. Louis

REGULAR monthly meeting of the St. Louis District Chapter of the AFA was held Nov. 8 at the DeSoto Hotel, with 83 members and guests attending. Chairman Walter E. Illig presided and Walter Zeis, chairman of the membership committee, reported 206 paid-up members, as of Oct. 31, and the addition of two new members. Jack Kelin, chairman of the entertainment committee, reported on plans for the Christmas party. Donald MacArthur, the Koppers Co., was winner of the attendance prize.

Al Hunt of National Bearing Division introduced the speaker, Dr. L. E. Hamlin, medical director, and his assistant, Herbert J. Weber, industrial hygienist, of American Brake Shoe Co. Dr. Hamlin's talk covered discussions of foundry health hazards and described the effects of silica on lung tissue. Causes and effects of silicosis were discussed, as well as lead intoxication and other typical health difficulties developing from plant operations. After completion of the talk, which was illustrated with slides, Dr. Hamlin and Mr. Weber answered questions from the audience.—*Lee H. Horneyer, secretary-treasurer.*

## Northwestern Pa.

NOV. 26 MEETING of the Northwestern Pennsylvania Chapter of the AFA attracted nearly 100 members and guests to the Moose Club, Erie, Pa. L. P. Robinson, the Werner G. Smith Co., Cleveland, ably furnished the technical feature of the evening's program with a discussion of "Variables in the Coreroom, Their Treatment and Cure."

Roger W. Griswold Jr., chapter chairman, reported on a luncheon meeting held the same day, at which management representatives of some 30 Erie district foundries were guests of the chapter and were made acquainted with the aims and activities of the association, particularly with reference to the educational program of interesting young men in the foundry industry. Principal speakers were the AFA national president, Fred J. Walls, International Nickel Co., Detroit, and William W. Maloney, national secretary.

Both Mr. Walls and Mr. Maloney also attended the evening session and spoke briefly on work of the association. Other out-of-town guests included Ralph T. Rycrofe, president, the Jewell Alloy & Malleable Co., Buffalo, and a national AFA director, and Gilbert J. Nock, the Nock Fire Brick Co., Cleveland, and secretary of the Northeastern Ohio Chapter.

Following a report by Earl M. Strick, vice chairman, on plans for the chapter's first Christmas party the meeting was turned over to the technical talk.

Illustrating his points with practical examples, and punctuating his discussion with pungent remarks, Mr. Robinson listed eight important factors which provide opportunity in the coreroom for variations in the final product. These sources of variables are: Sand, binder, ratio of sand to binder, moisture content, mulling, baking, venting, inspection. In the matter of sand and binder, he pointed out, the foundry should select and stick to the type and grade best adapted to its requirements. Once the proper sand mixtures have been worked out the ratios should be adhered to closely. Moisture content of the sand likewise should be checked carefully and constantly, and mulling time should not be permitted to vary.

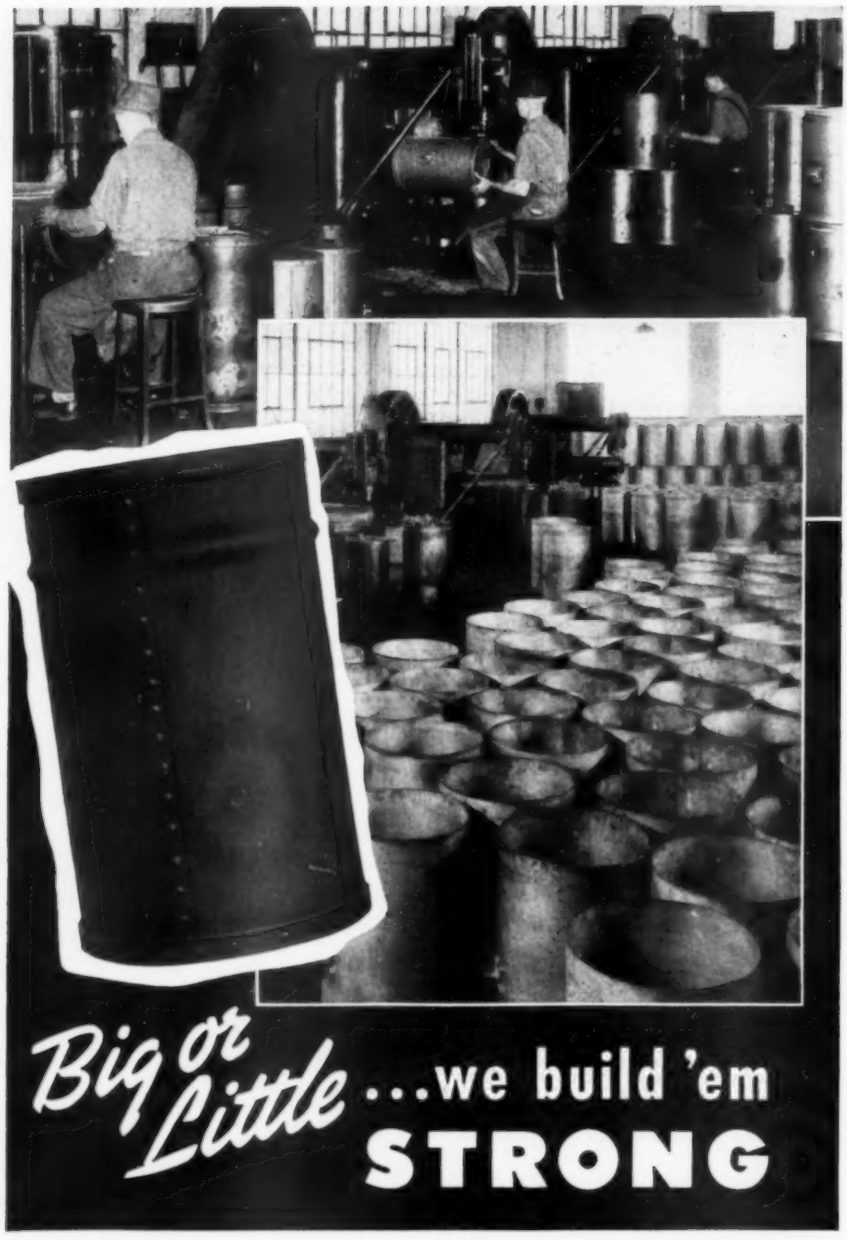
Most mistakes in making cores occur in baking, according to Mr. Robinson. This operation requires the proper relationship between time and temperature. Too much moisture in the sand and too fast baking frequently will result in cracking larger cores.—*William G. Gude.*

## Cleveland

APPROXIMATELY 125 members and guests of the Patternmaker's Group of the Associated Industries of Cleveland attended the Nov. 29 meeting in the Hollenden Hotel where dinner, refreshments and technical program were supplied by the Kindt-Collins Co.

Chairman V. Sedlon, Master Pattern Co., outlined the purpose of the general lecture course conducted by the group. He introduced E. T. Kindt, president, Kindt-Collins Co., and Carl Waite who later served as technical chairman, and introduced the various speakers and conducted the ensuing discussions. Mr. Kindt thanked the group for its attendance, welcomed the opportunity to display some new products, referred to long-continued interest in the pattern-making industry and promised that speakers on the technical program would cover subjects indicating advancement of the trade.

George Webber, Webber Gage Co., described the history, development and use of the Johansson precision gage, familiarly known in American shops as *jo-blocks*, the little steel blocks so incredibly accurate that—if the experiment were possible—the accumulated error in a mile would not amount to ⅛-in. Discussing the use of gypsum cement in the pattern shop, J. Wiss, U. S. Gypsum Cement Co., directed attention to the fact the material is not an ordinary plaster.

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Shop Boxes, all kinds, stock sizes or built to order • Shop Stools
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From top to bottom, Cleveland shop barrels in every detail proclaim strength and durability. Triple folded top and bottom hems —four thicknesses of metal give stiffness and strength where most needed. Designed and built throughout for long wear, these barrels are most economical in the long run. Furnished with trunnions, handles, or bails and other features to suit individual requirements.

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Cleveland
STEEL SHOP EQUIPMENT
STOCK STYLES FOR GENERAL UTILITY
BUILT-TO-ORDER to meet special requirements

Following a description of how the powder is prepared and shipped by the makers, he dwelt on the proper manner of preparing it for use in the shop. The amount of water controls the strength.

A new type of enduring, quick-drying and moisture-proof pattern coating was described by R. J. Brandt. W. B. Burt described and demonstrated new and improved types of rapping plates, fillet cement and pattern letters.—*Pat Dwyer.*

## *Pittsburgh*

DISTRICT foundrymen heard Tom E. Barlow, Battelle Memorial Institute, discuss cupola operations at the Pittsburgh Foundrymen's Association's November meeting. Mr. Barlow said that cupolas cannot be operated solely by formula and instruments; supervision is a main feature of close cupola operations. Close cupola control results in uniformity of analyses, plus the ability to reproduce analyses as desired.

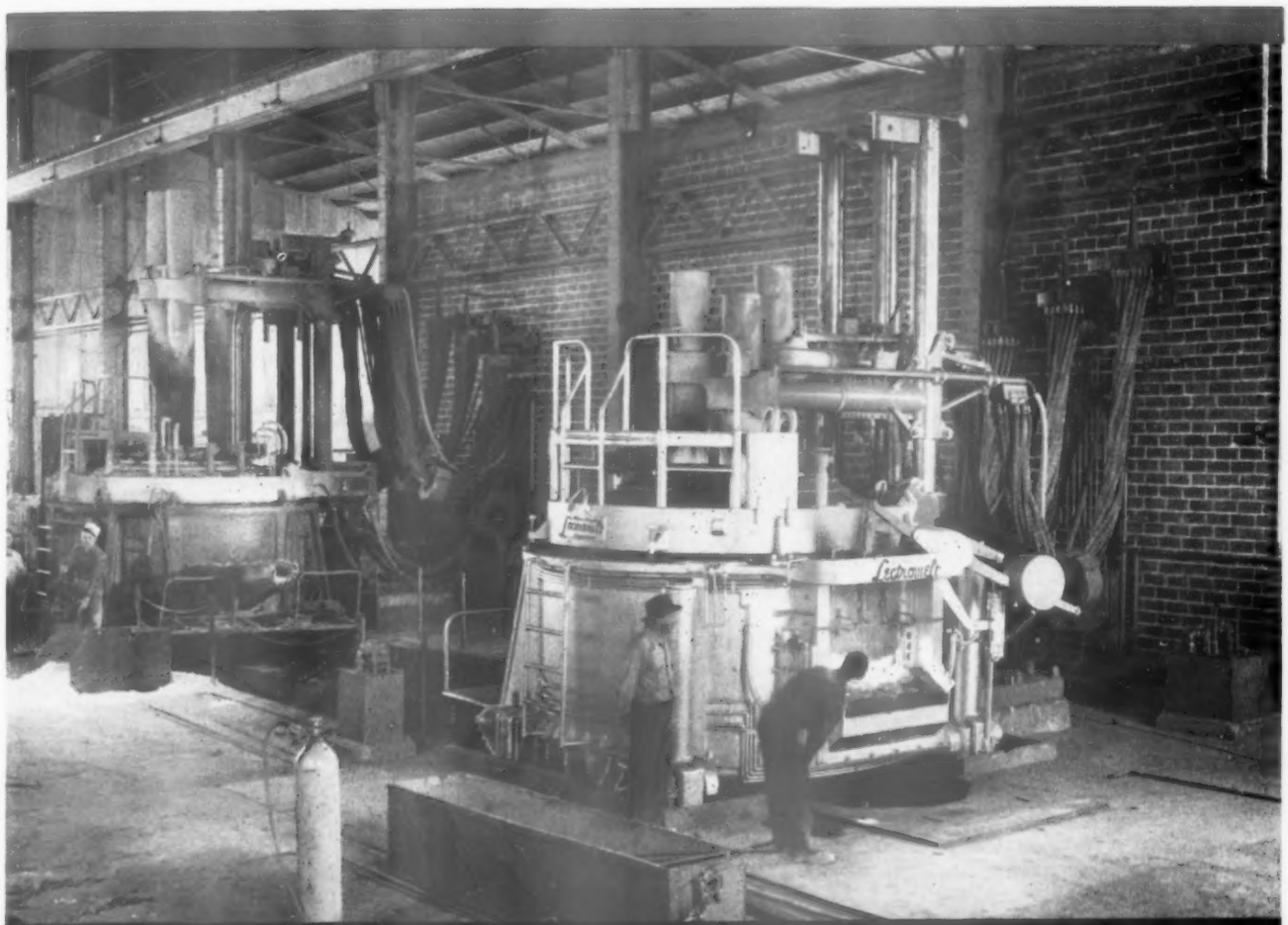
In addition to reproducing chemical analyses, close cupola control permits the reproduction of physical properties, Mr. Barlow stated. Even though irons have the same compositions, there can be variations in chill and this is reflected by change of physicals. In one instance that Mr. Barlow cited, the tensile test varied from 34,000 to 43,000 psi for irons having the same chemical compositions. This was accounted for by differences in the structures of the irons.

Too many cupolas, Mr. Barlow said, are run by remote control, whereas supervision should be from the charging and tapping floor. There are too many instances where foundries aim for irons far above the tensile strengths specified, in order to be on the safe side. One instance reported was a foundry that made iron to meet 40,000 to 42,000 psi tensile strength so as to be sure of getting 30,000 psi iron. He stated that this particular foundry wastes money and wastes the customer's money because such iron probably does not have the machinability, damping characteristics, or other properties that would speed up the customer's operations. Foundries should know at all times just exactly what iron they are making by running test bars regularly.

Foundry market of the future will emphasize engineering irons, Mr. Barlow said. By engineering irons, he pointed out, 70,000, 80,000 and 90,000 psi strengths were not necessarily meant, but what was intended was that the 30,000, 35,000, and 40,000 psi tensile strengths would have to meet machinability specifications, to be of specific hardnesses, and have other such specified properties.

Get control of your cupola, Mr. Barlow said, in making uniform iron. Know what you want, make it as uniform as possible

(*Continued on page* 176)



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**TIME**

In Lectromelt furnaces of modern top charge type the entire superstructure is quickly raised and rotated to permit rapid drop bottom bucket charging — result, more heats in less time.

**POWER**

Lectromelt substation equipment with multi-voltage power transformer and accurate controls, together with high thermal efficiency of the furnace equipment results in reduced power consumption.

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The Lectromelt patented counterbalanced electrode positioning mechanism, together with sensitive automatic controls results in minimum electrode consumption.

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Actual operating figures obtained from users show that the top charge type Lectromelt furnace definitely results in reduced refractory costs.

**MAINTENANCE**

Lectromelt maintenance costs are minimized because simplicity of design eliminates complex mechanism, repair or replacement of which is expensive.

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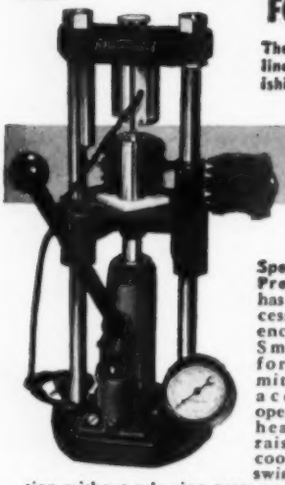
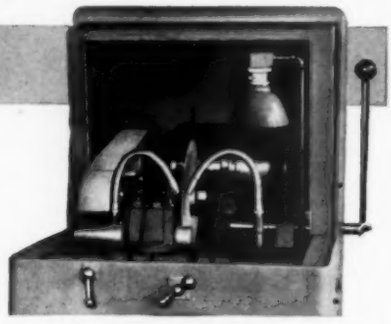
# Buehler

## SPECIMEN PREPARATION EQUIPMENT AND SUPPLIES FOR THE METALLURGICAL LABORATORY

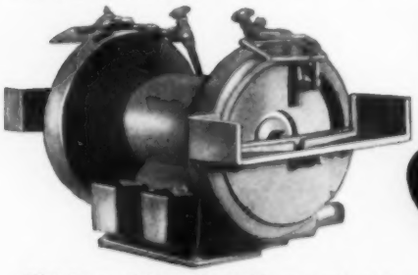
**The items illustrated are selected from the complete Buehler line of equipment, tools and accessories for molding and finishing specimen mounts.**



**Specimen Mount Press No. 1315** has complete accessibility, no enclosed parts. Smooth performance permits speed and accuracy in operation. Solid heater can be raised and the cooling blocks swing into position without releasing pressure on the mold. This rapid cooling permits production of transoptic mounts in a few minutes. Shipping weight, 100 lbs.



**Abrasive Cut-off Machine, Model No. 1000,** is a solidly built, heavy duty piece of equipment free from sideplay or vibration with capacity for cutting specimen sections up to 3-1/2". Cutting is done on the front of the wheel and is controlled by a convenient outside lever. The driving motor is a totally enclosed ball bearing, 3 hp. with a separate motor driving the self-contained cooling system. Overall dimensions of cabinet 31" x 47" x 64". Shipping weight, 1400 lbs.



**Wet Power Grinder No. 1210,** powered with a 3/4 hp. totally enclosed ball bearing motor has two 12" water cooled wheels fitted with closed-in guards and non-shatterable shields. Suitable for coarse and medium grinding. Shipping weight, 310 lbs.

**Hand Grinder No. 1410** is a most conveniently arranged two stage grinder. The grinding surfaces are 4-1/2" x 12-1/4" each with heavy 7/16" thick plate glass back. A reserve roll of 150 feet of emery paper is contained in drums for quick renewal of grinding surface. Base has gutter drains for surplus liquid in wet grinding operations. Shipping weight, 95 lbs.

**Standard Polisher No. 1500.** A complete unit with direct mounted ¼ hp. radial thrust ball bearing motor. The 8" polishing disc is attached to a tapered arbor on the motor shaft by means of a stout sleeve. This sturdy construction and unusually smooth vibrationless operation helps to prevent pitting and amorphous film in polishing. The removable splash ring forms a convenient hand rest that aids the operator in precision work. A handy control lever on the mounted switch gives selective speeds of 575 and 1150 r.p.m. Shipping weight, 100 lbs.

**Low Speed Polisher No. 1505-2,** is particularly adapted to final stage polishing and for non-ferrous metal samples. The 8" disc is attached to a countershaft by a tapered sleeve with a long span between bearings, a construction feature that assures smooth operation. The selective speeds of 150 and 250 r.p.m. make this polisher perfectly adapted to the wax lap or lead lap polishing technique. Shipping weight, 105 lbs.

Either the standard or low speed polishers can be furnished in a single unit table model polisher No. 1516. A three unit table model No. 1540 is also available for maximum convenience in three stage polishing.

In the complete line of Buehler accessories and supplies for the metallurgical laboratory are found: Abrasive paper sheets, discs, and rolls in every grade • polishing solutions • polishing cloths • cut-off wheels and molding powders. Buehler service includes everything needed for preparing precision specimens from metallurgical samples, available from one reliable source.

Buehler Ltd.
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METALLURGICAL APPARATUS
165 West Wacker Drive, Chicago 1, Illinois


(*Continued from page* 174)

by making everything inside the cupola uniform. Contrary to popular opinion, identical cupolas will operate identically if all parts of the cupolas are set up identically. However, it is too often the tendency to alibi equipment, he said. Further, it should be proved that all parts are operating identically.

Supervision covers all phases of cupola operations from the purchase, installation and maintenance of equipment, to the point where the product is shipped from the foundry.

At the January meeting, E. C. Zirzow, National Malleable & Steel Castings Co., Cleveland, will discuss "Sand Practice," dealing primarily with synthetic sand. The Pittsburgh Foundrymen's Association annual Christmas party was held Dec. 19.—*Joseph C. Sullivan.*

## *Ontario*

SOME Aspects of Foundry Postwar Problems" was the subject of the address by E. Holt Gurney, Gurney Foundry Co. Ltd., Toronto, at the season's first meeting of the Ontario Chapter of the AFA, Sept. 28 at the Royal Connaught Hotel, Hamilton. The speaker was introduced by J. A. Wotherspoon, Anthes-Imperial Ltd., and vice chairman of the chapter.

Mr. Gurney discussed the application of statistical quality control in the foundry, illustrating the techniques by reference to tank shoe production at Electric Steels Ltd., Cap de la Madeleine, Quebec. Designed originally for production of 500-lb bombs, this plant was converted to manufacture tank shoes from high manganese (11-14 per cent) steel. Due to the high shrinkage characteristics of this steel a foundry was considered lucky if it had a loss under 18 to 20 per cent. The problem of producing sound castings was aggravated by the design of the tank shoes, involving sudden changes from very light to very heavy sections.

The speaker described in a simple manner the procedure followed in the application of statistical quality control to the reduction of scrap castings. The principal factors causing scrap were determined and reduced to the point where average losses of nearly 14 per cent were cut to approximately 2 per cent.

Mr. Gurney indicated that the system of statistical quality control had many ramifications and that it could be expected to be versatile tool in the improvement of foundry practice in the postwar period.

With about 125 in attendance, the Ontario Chapter held a highly successful group meeting at the Royal York Hotel on Oct. 25. Present at the head table

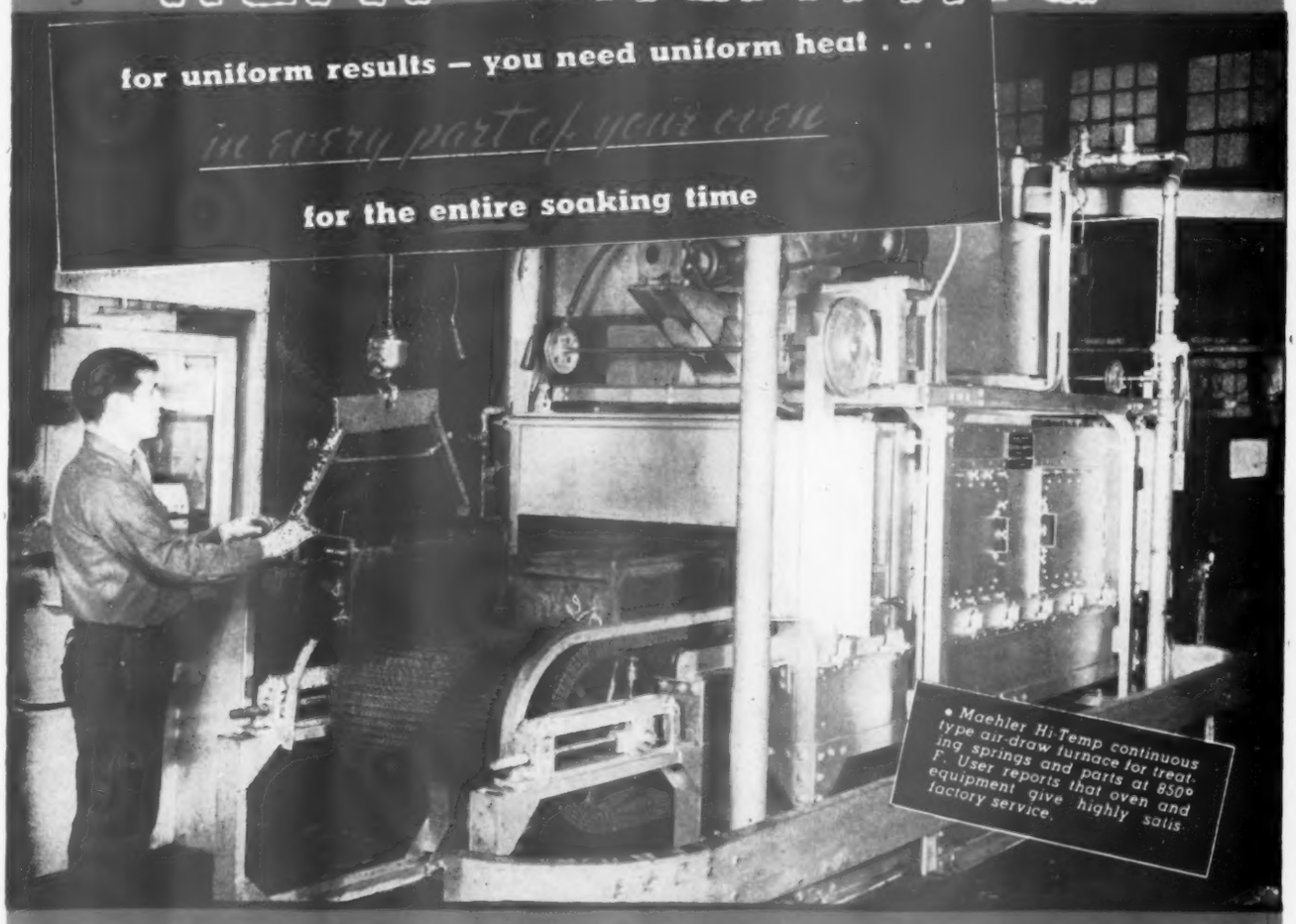
(*Continued on page* 180)

# HEAT TREATING

for uniform results — you need uniform heat . . .

*in every part of your oven*

for the entire soaking time


• Maehler Hi-Temp continuous type air-draw furnace for treating springs and parts at 850° F. User reports that oven and equipment give highly satisfactory service.

*recent tests show* **MAEHLER** ovens give you temperature variations *of not over 2° F.!*

CAREFUL tests, made during actual operation, show a variation of not over 2° F. in Maehler Ovens. Here indeed is the answer to your need that will assure you of more uniform results — will increase efficiency and reduce the number of rejects due to improper heat treating.

Maehler's long experience designing and building ovens for the heat treatment of all kinds of metal can help you obtain better results too. Maehler ovens — oil fired, gas fired or electrically heated are available for handling temperatures up to 1300° F.

If you're interested, we'll be glad to give you names of companies using Maehler ovens for work similar to yours. Our engineers can work with you in designing a complete heat treating system to help you do your job best. Write today for full information. No obligation.

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Industrial Ovens and Furnaces for Normalizing, Stress-relieving, Bluing, Aging, Tempering, Annealing, Drawing, Etc.

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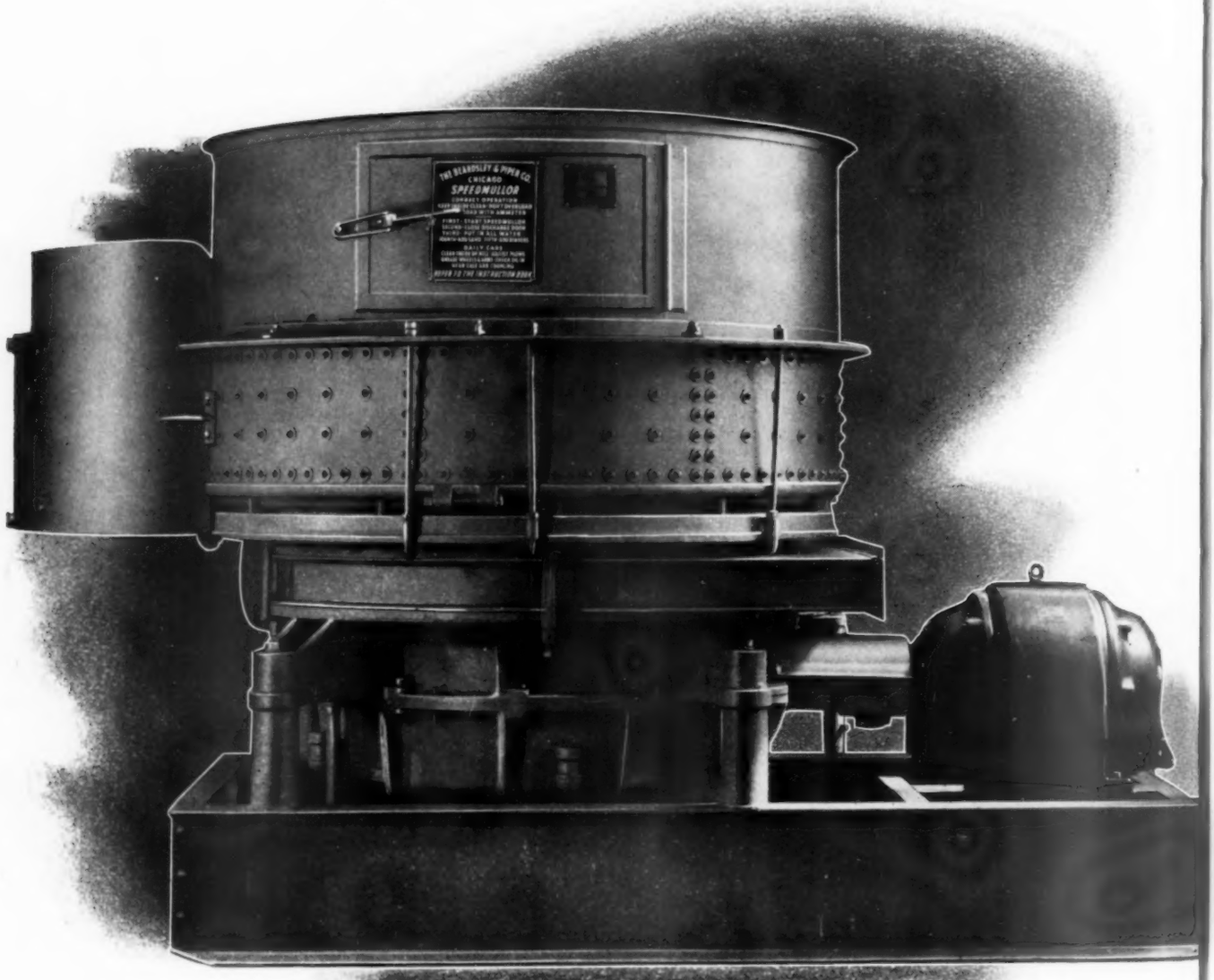



Speedmullor — model 80 — batch size 20 cu. ft.

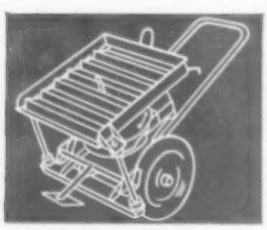
B & P Screenarator — cuts, screws, double aerates, and piles — at low cost.

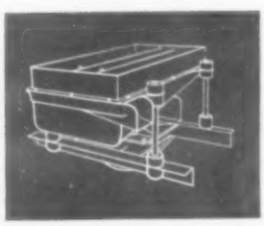
B&P Portable Sand Conditioner — portable, low cost — an efficient machine in any foundry.

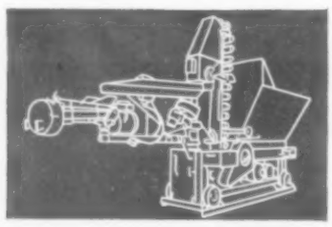
B&P Gyratory Screen — assures improved sand conditions at maximum capacity and at lowest cost.

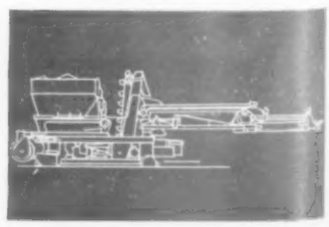
B&P Sandslinger — saves floor space, improves castings, lowers costs, and increases production.

B & P Speedslinger — performs the ramming labor of 50 skilled men — does a superior ramming job.









# WITH THE *Speedmullor*

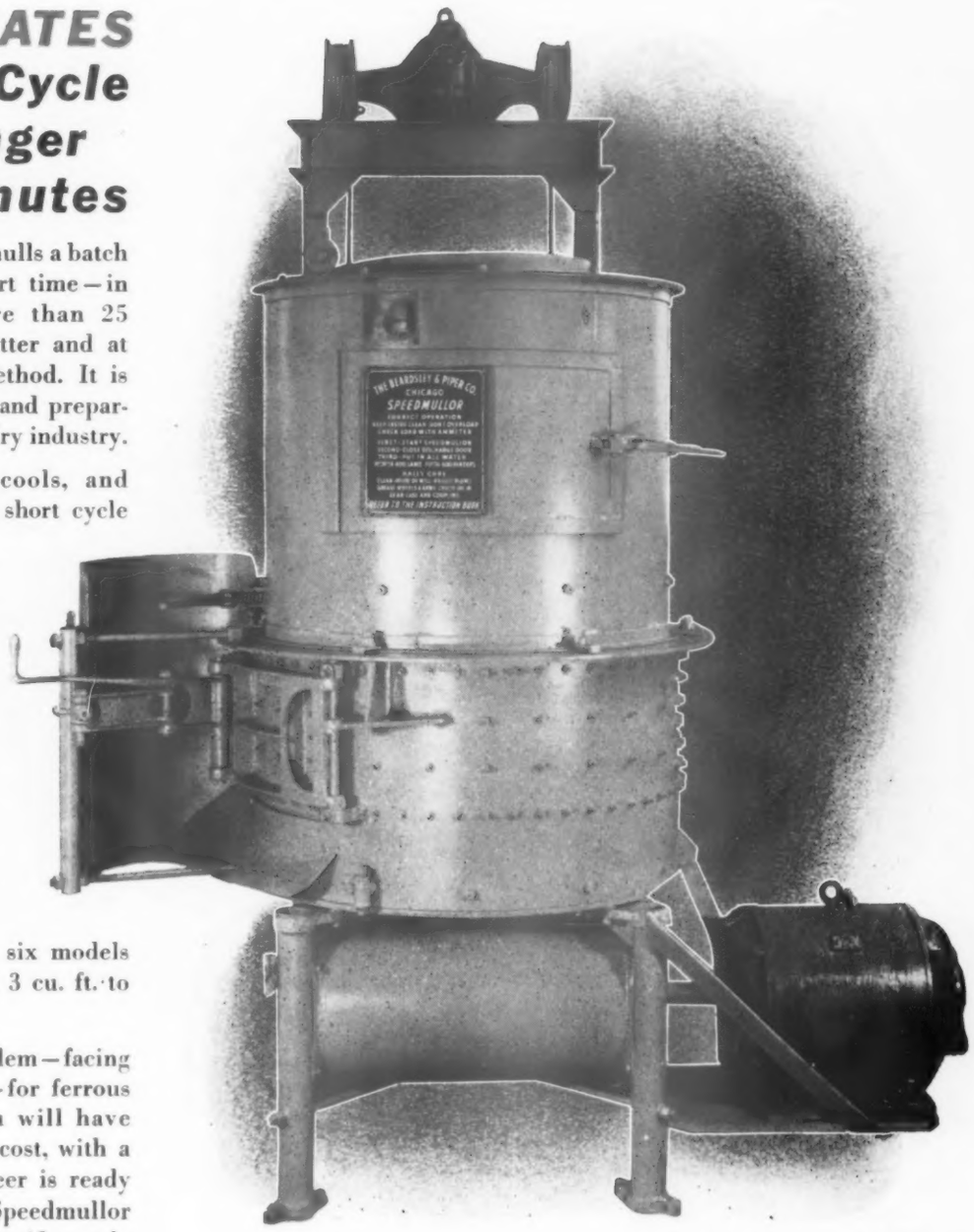
## MULLS–AERATES COOLS–In a Cycle Seldom Longer Than 1½ Minutes

The Speedmullor thoroughly mulls a batch of sand in a remarkably short time—in some instances in not more than 25 seconds. It prepares sand better and at lower cost than any other method. It is the greatest advancement in sand preparation ever offered to the foundry industry.

The Speedmullor aerates, cools, and thoroughly mulls in a single short cycle which is seldom longer than 1½ min. It is economical of floor space, and requires fewer manhours per ton of sand mulled. Up to 25% less core oils and 50% less binders are used because of better and more even distribution. Sand prepared in the Speedmullor makes better molds and better castings, and it saves drying, shake-out, and cleaning time.

The Speedmullor is made in six models which range in capacity from 3 cu. ft. to 20 cu. ft. per batch.

Whatever your mulling problem—facing sand, backing sand, or cores—for ferrous or nonferrous castings—you will have better mulled sand, at lower cost, with a Speedmullor. A B & P engineer is ready to show you how to apply Speedmullor speed and savings to your specific problem—and at no obligation to you.




**Speedmullor—model 30 —batch size 3 cu. ft.**

THE BEARDSLEY & PIPER COMPANY

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(*Continued from page* 176)

on this occasion were a number of the men who played a very important part in the founding and early development of the chapter. This included Maj. L. L. Anthes, Anthes Imperial Ltd.; S. R. Francis, Metals & Alloys Ltd.; and D. J. Macdonald, Standard Sanitary & Dominion Radiator Ltd.

Chairman T. D. Barnes, Don. Barnes Foundry Supplies & Equipment Ltd., called upon each of the three for a few words in which they emphasized the development of Ontario Chapter from the time of the first meeting when approximately 17 attended.

At the Gray Iron Section, under the chairmanship of Andrew Reyburn, Massey-Harris Co. Ltd., the discussion leaders were G. J. Gaukroger, McKinnon Industries Ltd., and W. J. Brill, Canadian General Electric Co. Ltd. One subject which received considerable attention was cupola practice, with various techniques of lining and operating outlined, and a lively exchange of ideas on the subject of forcing cupolas taking place. Contour lining of cupolas was mentioned but had not been tried by any of the foundrymen present. It was the majority opinion that it is far better to have a large cupola and melt under capacity, than to use a slightly smaller lined cupola at a production over the rated maximum. Prominent in this discussion were D. J. Macdonald and O. A. Davies, Standard Sanitary & Dominion Radiator Ltd.; Reg. Williams and R. Vollick, Canadian Westinghouse Co. Ltd.

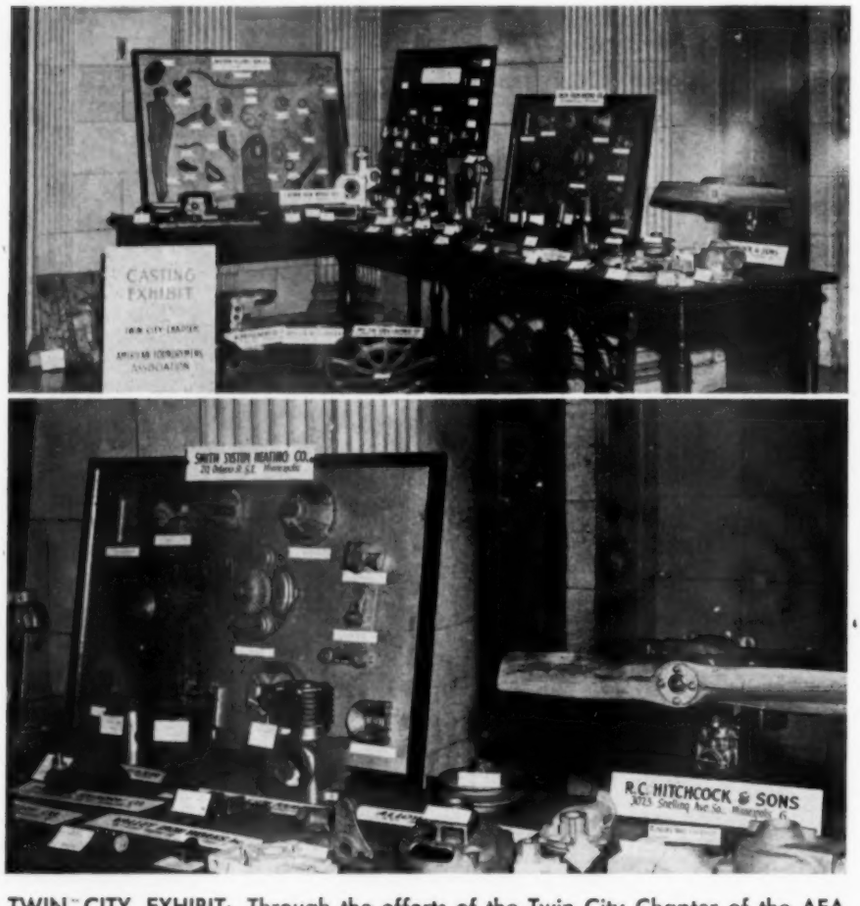
Coke consumption and ratios were discussed by J. Wotherspoon, Anthes Imperial Ltd. Mr. Reyburn made a few remarks on the practice followed in the new foundry of Massey-Harris Co. Ltd., Brantford, in respect to sand. He was of the opinion that a great deal could be done to improve sand control in jobbing foundries operating entirely with heap sand.

In the Nonferrous Group, under the chairmanship of George Bruce, Beatty Bros. Ltd., the subject was "A Mechanized Brass Foundry," by Thomas Lyons, Empire Brass Mfg. Co. Ltd., London, Ont. The speaker pointed out that the requirements of war production, coupled with short supply of labor, made necessary the simplification of work to use inexperienced help, and the increase of production with the same amount of labor and floor space.

Mr. Lyons described the mechanization plan which was started by his company early in 1944 and which was carried through with only one week's loss of production. Within a short time after completion of the installation, production was increased by about 80 per cent. The speaker described in some detail the principal mechanical features which had enabled the foundry to achieve this success in production.

At the Malleable Group, under the chairmanship of E. G. Storie, Fittings Ltd., Oshawa, Ont., J. J. McFadyen, Galt Malleable Iron Co. Ltd., spoke on "Some Observations in Mechanized Foundries."

*—G. L. White, secretary-treasurer.*




**TWIN CITY EXHIBIT: Through the efforts of the Twin City Chapter of the AFA the public of that area has been given a better appreciation of the importance of the foundry industry. The chapter's Exhibit Committee prepared the display of castings shown here, the exhibit first being shown at the James J. Hill Reference Library, St. Paul, later moved to the St. Paul Public Library where it is being enlarged. Castings of various metals are shown and include, among others, such parts as truck engine pistons, tractor cylinders and heads, washing machine motor parts, kitchen faucets and ornamental castings. The exhibit was well publicized through the schools and daily papers**

## *Metropolitan*

CENTRIFUGAL casting of ferrous and nonferrous metals came in for an extensive discussion at the second fall meeting of the Metropolitan Chapter of the AFA, Nov. 5, at the Essex House, Newark, N. J. Chairman Horace A. Deane turned the meeting over to D. W. Talbot, Cooper Alloy Foundry Co., technical chairman. Mr. Talbot introduced Dr. Arthur E. Schuh, director of research, U. S. Pipe & Foundry Co., Burlington, N. J., the guest speaker.

"Centrifugal casting of metals is not a cure-all for foundry trouble," declared Dr. Schuh, "but on work adaptable to the process, it offers a means of producing high quality castings at a low cost." Tracing the history of centrifugal casting from its beginning in 1807 to the experiments of Bessemer in 1850, the casting of iron car wheels in 1902 and the development of sand lined molds in 1920, the speaker mentioned the work of the Watertown Arsenal where gun barrels 33 ft. long and weighing 18 tons, are being cast by the process.

Four reasons given for expansion of the process during the war period were: Low capital investment; less time consumed in getting started due to obtaining and installing the smaller amount of equipment required; high yields obtained averaging 60 to 80 per cent instead of 40 to 50 per cent as in the static process; and high level quality of work adapted to the process. Accompanying his talk with slides illustrating various installations, machines and castings produced, Dr.

Schuh stated that provisions for directional solidification must be obtained, for good quality semicentrifugal castings are, by the very nature of the process, free of internal shrinks. Stock for finish on the inside diameter must be increased for heavy-walled pipes, however.

The speaker explained that metal molds used in the true centrifugal process are sprayed with a refractory coating of 0.002-inch, which serves two purposes. It protects the mold and gives traction to the pickup of this fluid metal. The speeds at which true centrifugal machines should operate are at about 1000 peripheral fpm for metal molds and from 1200 to 1500 peripheral fpm for sand molds. The latter should be run longer on this machinery as the cooling process is slower. Too high a speed results in longitudinal cracks in the casting.

Pointing to the new development of his company in the spinning of two or more metals in a single casting, Dr. Schuh exhibited castings in which copper was poured immediately after steel, producing a steel pipe lined with copper. Fusion between the two metals was perfect and remained so after the pipe was drawn down to ⅛-in. diameter. A composite steel and iron pipe was also shown. Mr. Talbot exhibited a centrifugally-cast supercharger ring and guided the discussion which followed Dr. Schuh's talk.—

More than three hundred foundrymen turned out for the Metropolitan Chapter's annual Christmas party at the Essex House, Newark, Dec. 7. Dinner, refreshments and good entertainment made for a most enjoyable occasion. Committee in charge of arrangements for the affair consisted of D. S. Yoemans, George F. Pettinos Inc., chairman; Alexander McIntosh, Wright Aeronautical Corp.; T. D. Parker, Climax Molybdenum Co.; H. A. Robinson, Republic Steel Corp.; B. E. Beldin, Whitehead Bros. Co.; E. B. Smith, American Brake Shoe Co.; K. A. De Longe, International Nickel Co.; and Harold L. Ullrich, Sacks-Barlow Foundries Inc., and Frank B. Eliason, Pennsylvania Foundry Supply & Sand Co.—*C. J. Law.*

## *New England*

MORE than 100 members and guests attended the regular monthly meeting of the New England Foundrymen's Association, Nov. 14, at the Engineers' Club, Boston. Following dinner, Thomas G. Johnson, metallurgical engineer, pig iron & by-products division, Republic Steel Corp., Cleveland, was introduced as guest speaker.

Mr. Johnson, formerly metallurgist and superintendent, U. S. Pipe & Foundry Co., spoke on "Cupola Practice," a subject popular with New England foundry-


MULBARO Cuts

SAND PREPARATION TIME 50%

"A 50% cut in our core sand preparation time with the Mulbaro! That's a real saving!" say officials of the Milwaukee Flush Valve Company, Milwaukee, Wisc. "What's more, the Mulbaro has paid for itself in oil savings alone in less than a year, due to more thorough, more uniform sand mulling which meets our exact molding requirements." Foundries, large and small, use the Mulbaro for facing and backing as well as core sand.

How the Mulbaro works: Sand is shoveled into barrow. Filled barrow is then wheeled into position under the mulling unit.

Mulling unit is lowered onto barrow with a hoist. Required amount of oil is added and within a few minutes, sand is completely mulled.

Mulled sand is now moved away to molding machines; another barrow of sand is placed under mulling unit.

ONLY $895*

*Entire Mulbaro unit costs only $895.00 F.O.B. Chicago . . . additional barrows are $95.00 each.

Get complete engineering data and specifications on this amazing mullor . . . write today!

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# CRUCIBLE MELTING

## Stepping up with the Foundries

Barnes Manufacturing Company Foundry at Mansfield, Ohio, showing some of the 21 stationary type modern Crucible furnaces using both No. 60 and No. 70 Crucibles. Melting output during the war, 50,000 pounds brass and bronze per shift. Entire output in Navy fire fighting equipment and bronze fittings. Three furnaces on gas, 18 on oil fuel.

No. 7 of a series of typical Crucible installations

Barnes Manufacturing Company of Mansfield, Ohio celebrating Golden Anniversary; fifty years of progress includes the modernization of their foundry with up-to-date crucible furnaces.

Crucible melting year by year has kept step with the progress of this veteran foundry. Hundreds of other non-ferrous foundries throughout the land have modernized with crucible furnaces.

For economy, flexibility and all-around convenience, at a minimum investment, nothing takes the place of Crucible melting. It is the most satisfactory standard melting method.

Ask for Crucible Melters' Handbook.

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men. By a series of ingenious diagrams on a blackboard, he demonstrated the action which takes place in the various zones of a cupola, with particular reference to chemical reaction. Calling attention to the necessity for watching the quality of coke used, the speaker stressed that this is a most important item in producing good iron. Each foundry must determine the correct size of coke for each cupola and see that it is used, to obtain the best results for each melting unit. An effort should be made to carry a uniform moisture content in the air throughout the year.

A prolonged discussion followed the address, and various subjects, from pig iron to refractories, were covered. W. H. Rushworth of General Refractories Co., commented briefly on refractory troubles experienced in the melting zone.—*Merton A. Hosmer, president.*

## *Wisconsin*

NOVEMBER meeting of the Wisconsin Chapter of the AFA was addressed by Bruce L. Simpson, who gave a complete history of the foundry industry from its beginning, about 4000 B. C., until the time that technical societies began to record the history, which was near the turn of the twentieth century.

This history covered the development of castings from pure copper, through bronze and brass, into cast iron, steel and malleable. It established the beginning points of various types of molding practices, some of which are carried on today, and detailed the developments of types of equipment which enabled foundries to accomplish their work. Mr. Simpson illustrated his talk with slides.—*Walter Gerlinger, chairman, publicity committee.*

## *Texas*

THE FIRST joint meeting of what is hoped to be a continuing plan of the Texas Chapter of the AFA and students of Texas A. & M. College, was held in a two-day session, Nov. 9-10, on the campus at College Station, Tex.

This initial conference was deemed a complete success by the participating engineering students, as well as by association members and college faculty. The program chairman, William M. Ferguson, together with F. M. Ettlinger, past chairman, and Lloyd Berryman of A. & M. College, were commended for their combined efforts in arranging the affair.

The conference was formally opened at 1:30 p.m. under the gavel of Chapter Chairman Ed Trout, in the Engineers building, with about 20 foundrymen and 80 students in attendance. Mr. Trout presented the college with "Men in Progress," an early-American engraved pic-

(*Continued on page* 184)

***Do You Want to Avoid Blows, Cuts and Washes?***
***Do You Want to Save Corners and Edges of your Molds?***
***Do You Want Very High Dry Strength?***
***Do You Want to Reduce the Dead Clay in your Sand?***

If so, then you unquestionably want

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¶ This specialized product gives you very high green strength. You use less material. There is less dead clay left in your sand.

¶ You get higher dry strength than with any other type of bonding clay. This prevents cuts and washes, especially in steel foundries. Also, high permeability safeguards against blows.

¶ Black Hills Bentonite has greater resilience than any other clay. Advantage: less danger of breaking molds at corners and along edges.

¶ No other clay or combination of clays equals Black Hills Bentonite in the combination of high hot strength and high permeability.

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Remember, please, that ECP service engineers have *five* bonding clays and their many combinations from which to give you the one right recommendation for your purpose and to insure your receiving the *most bonding strength for your dollar.*

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*A Foundry Sand Service Based Upon Practical Research*

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Yes, you save time—and *plenty* of it—with a Robins Floatex Foundry Shakeout — *Job-Engineered* to meet your exact requirements.

With a Floatex, for example, *one man* can completely shake out an 8-ton dry-sand cope, 9 feet square and 12 inches deep, *in only 35 seconds!* What's more, *one man* can center a flask on the Floatex . . . operate the unit . . . and remove the material left on the surface after shaking. A Robins Floatex also reduces flask breakage to an absolute minimum.

Why not write today for the Robins answer to *your* foundry problems? Complete information on Robins Floatex Foundry Shakeouts or other Robins materials handling products will be gladly furnished on request.

Robins Floatex Shakeouts are made in Portable models for loaded flask weighing up to 17 tons; in Standard models, up to 100 tons or more—non-discharging and self-discharging types; with and without flask loaders.

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*AMERICA'S ONLY COMPLETE MATERIALS HANDLING SERVICE* — Hewitt and Robins unite to offer you 134 years of combined experience in Job-Engineered rubber products and machinery for every materials handling problem you have.


(*Continued from page* 182)

ture made in the year 1862. It was accepted in behalf of the college by C. W. Crawford, dean of mechanical engineering.

After announcement of the program and the theme of the two-day session, the chair introduced the chapter program chairman, W. M. Ferguson, who announced and introduced the several speakers.

The first speaker, L. H. August, process engineer, the Hughes Tool Co., gave an illustrated paper on "Cast Steel," recounting the problems of cast metals and classifying and describing such foundry practices as patternmaking, molding, melting, and heat treating.

Jack Klein, vice-president, the Lufkin Foundry & Machine Co., followed with a paper on different practices involved in the melting and critical annealing processes of malleable iron.

After a short recess, L. H. Roberts, president, the Oil City Iron Works, discussed the general subject of iron, drawing to the attention of the students the need of production engineering and improvement of methods in the gray iron industry. He described the trend of iron founding from an art to a science, which has opened up a large field for energetic new blood.

### Visit Engineering Laboratories

A colored film was next shown, illustrating operations of the Belle City Malleable Iron Co., Racine, Wis. This was followed by a tour of inspection of the college engineering laboratories by the chapter group, after which a recess was ordered until dinner. A sizeable number of students attended the dinner as guests of the chapter. The dinner session was opened with the introduction of distinguished guests by the chairman, Ed Trout, who further outlined the purposes and aims of the local chapter as the development of Texas products by Texas science and with technically trained men, which would open up tremendous opportunities for college-trained engineers in the foundry industry.

At this time, the past chairman and a leader in organizing the Texas Chapter, F. M. Wittlinger, was introduced, and presented the main speaker of the evening, Adrian Den Brejen, the Hydro-Blast Corp., Chicago. His talk on "Sand and Sand Problems in the Foundry Industry" was illustrated and proved of considerable interest, being followed by a general discussion in which the students took an interested part.

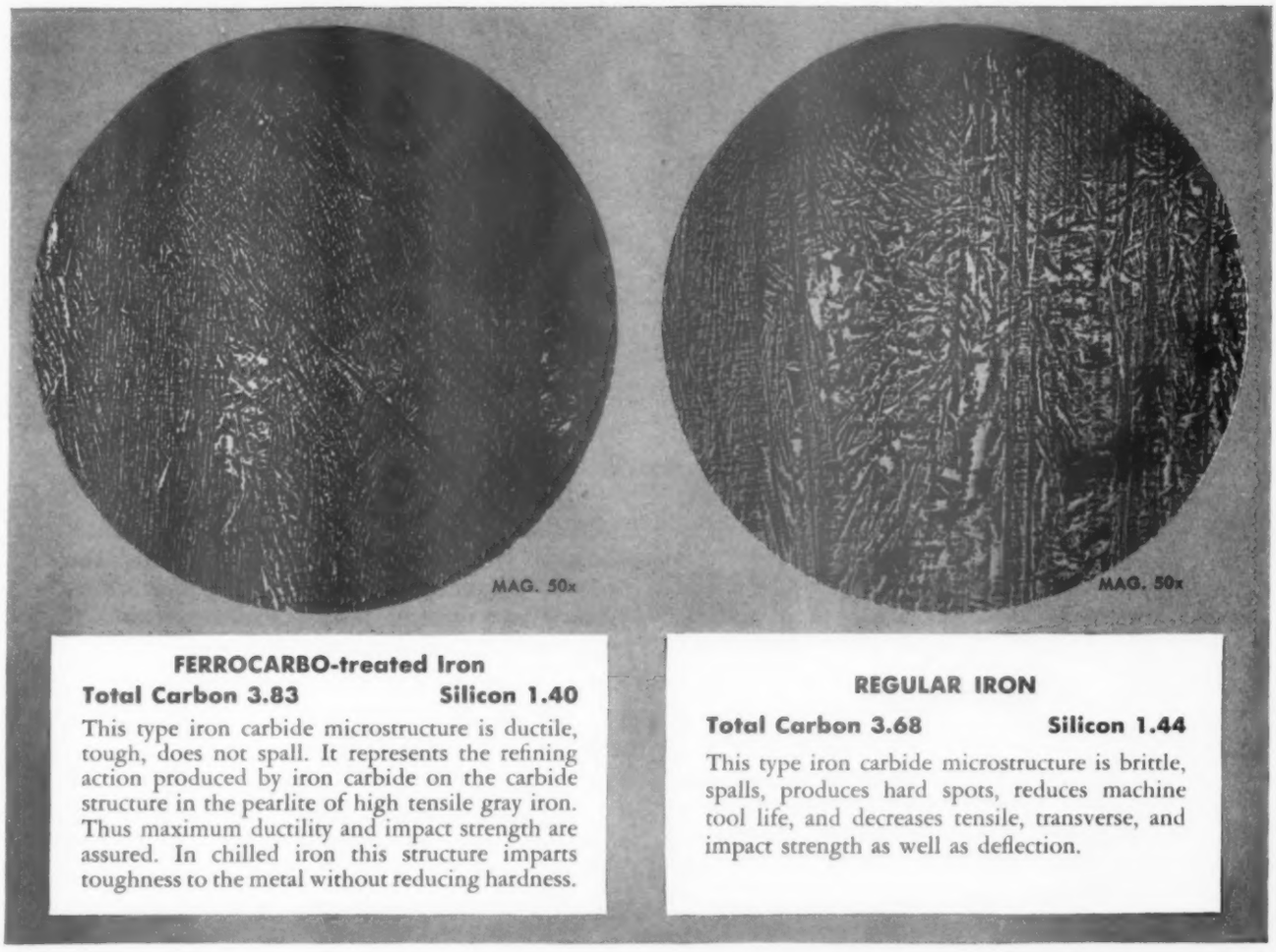
Saturday morning's meeting was opened with the introduction of the AFA personnel in attendance, and was followed by an illustrated talk by R. E. Bockrath, the Dow Chemical Co., in which he dis-

(*Continued on page* 187)

# FERROCARBO Briquettes

## provide a modern and effective method for deoxidizing and inoculating iron

The two photomicrographs below show iron of practically the same chemical composition. The FERROCARBO-treated iron, however, has a compact uniform structure in which the carbide is highly refined. The untreated metal, on the other hand, has a coarse columnar structure with resultant poor physical and machining properties.




**FERROCARBO-treated Iron**

**Total Carbon 3.83** **Silicon 1.40**

This type iron carbide microstructure is ductile, tough, does not spall. It represents the refining action produced by iron carbide on the carbide structure in the pearlite of high tensile gray iron. Thus maximum ductility and impact strength are assured. In chilled iron this structure imparts toughness to the metal without reducing hardness.

**REGULAR IRON**

**Total Carbon 3.68** **Silicon 1.44**

This type iron carbide microstructure is brittle, spalls, produces hard spots, reduces machine tool life, and decreases tensile, transverse, and impact strength as well as deflection.

The above facts are borne out by years of application to high strength iron in both the chilled and gray iron fields. For further information on the advantages and use of FERROCARBO, write us.

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# "NO MORE HOARDING OF *Undependable Vibrators* IN 1946 FOR ME!"

"No, thanks!" resolves the far-sighted foundryman. "As a rule, it doesn't pay us to fool around with 'em in point of either money or time, which amounts to the same thing.

"Pampering or restoring old, undependable vibrators isn't smart business. Our molders shouldn't be saddled with this thankless job; they're expected to turn out good molds fast. Our maintenance men, likewise, have more important work, keeping the rest of the plant running as it should.

"Of course, if it's some very small detail, like replacing the spring or cleaning, we might attend to it. But we'd have to be mighty sure that performance thereafter would be like new, and would stay so for a long, long while. Even then, we'd rather pack up a flock of ailing vibrators and shoot 'em out to the manufacturer to inspect and fix up if advisable.

"No, it's hardly wise for any foundry to waste time repairing worn or damaged vibrators. Unless the *factory can restore them to proper operating efficiency for us, into the scrap heap they go! In 1946 and every other year."

**SPO Vibrators can be factory reconditioned.*

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SPO also builds both molding machines and pattern equipment, and guarantees every job too in full accordance with your specifications.

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*Manufacturers and Specialists in Molding Machines, Vibrators and Patterns for Production*

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MANUFACTURER'S ASSOCIATION INC. FOUNDRY EQUIPMENT

(*Continued from page* 184)

cussed the magnesium industry, magnesium characteristics, and the metal's applications in commercial uses.

The final paper was given by P. B. Groom, owner, the Huston Pattern Works, on the subject of patternmaking. His talk stressed the importance of patterns to foundry production and ultimately to the consumer, and detailed the types of patterns applicable to foundry practice and to the refinements of pattern construction as well as their classification.

Before adjournment, C. W. Crawford, on behalf of the college, thanked the association members for their efforts in the presentation, and invited them to return as often as they could to repeat the educational program.

After adjournment, the group attended a tasty barbecue at the Wellborn Ranch, which was ably administered by Mr. and Mrs. Abe Henserling, and then attended the A.&M.-S.M.U. football game at Kyle Field. P. S.: A.&M. College won.—*R. B. Mumford.*

## *Michiana*

REGULAR meeting of the Michiana Chapter of the AFA was held Nov. 6 at the LaSalle Hotel, South Bend, Ind. William V. Johnson, chapter chairman, presided. Three fine musical numbers were rendered by the Chamberlain family, a barber shop quartet, following which James Jehring, district representative of Purdue University, gave a short talk on the schools of technology which the university is opening in industrial centers.

Leonard Tucker, City Pattern Works, then introduced E. H. Schleede, U. S. Gypsum Co., whose subject was "Patternmaking with Gypsum Cements." Some of these gypsum cements, commonly called plaster of paris, are of the lowest expansion materials possible to use. Accompanying the talk with sound slide projector, the speaker explained and demonstrated the use of the gypsum materials by mixing a quantity of the cement with water, producing a composition used for patterns. Stressing the importance of adding the proper amount of water, as well as the method of stirring and mixing, it was shown that if the material is soaked, patterns can be made of cement that can be held to plus or minus 0.005-in., durable enough to hold these sizes for years.

Following the dinner at the Dec. 4 meeting of the chapter, which was held at the LaSalle Hotel, South Bend, pictures of the last three annual outings of the chapter were shown by Len Tucker. The 1945 pictures were in technicolor. Chapter Vice President John McIntee then introduced the new members who have joined the chapter since last spring.

Arthur Nelson, program chairman, in-


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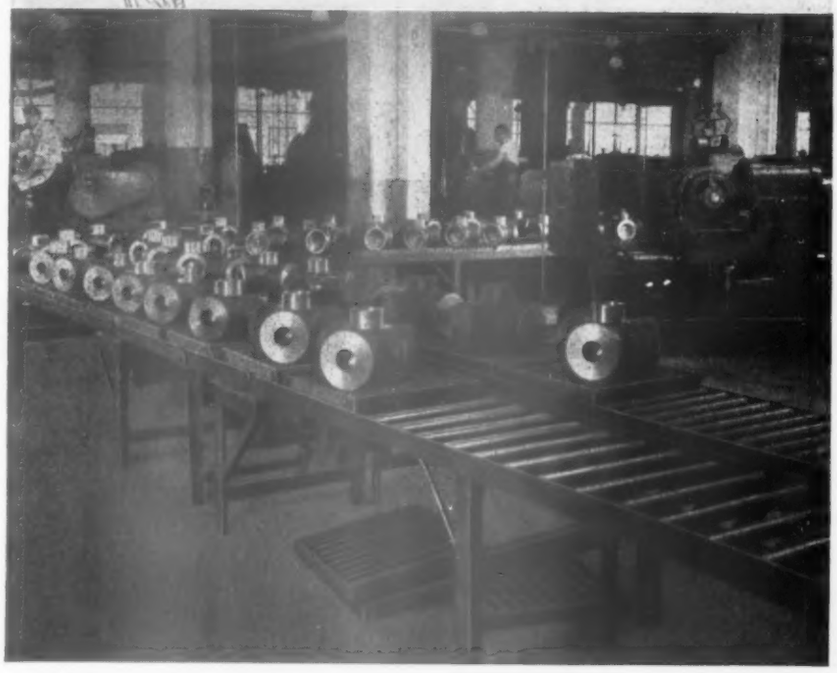
"GOOD HOUSEKEEPING"
*Pays Dividends!*



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DIRECT DRIVE
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MAINTAINED CAPACITY FOR THE LIFE OF THE MACHINE
UNNECESSARY BULK ELIMINATED
NO BEARING TAKE-UP
NO LEAKING VALVES OR GRINDING OF SEATS
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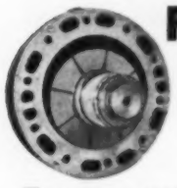
SIMPLE DESIGN...



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C-136

FULLER
PIONEERS OF HIGH-EFFICIENCY ROTARY COMPRESSORS

troduced the guest speaker, A. S. Klopf, of Lester B. Knight & Associates, Chicago, whose subject was "Casting Defects." Mr. Klopf, chairman of the Chicago Chapter last year, gave a thorough explanation of the work done by the Scrap Committee of the AFA, of which he is a member, and of the book on scrap which is now being printed. He stated that when the book is completed it will be possible to make a closer study of scrap conditions by referring to the data for comparison and to the methods used by foundries in the past to effect cures for common defects. Mr. Klopf supplemented his talk by the use of slides to clarify the points stressed. A question and answer period followed the discussion.—*Howard B. Voorhees.*

## *Northern California*

MEETING of the Northern California Chapter of the AFA, Nov. 8, at the Hotel Alameda, Alameda, Calif., had special significance, in that it brought to a close the first ten years of the chapter's activities. When the chapter was organized in November, 1935, Clarence M. Henderson of the H. C. Macaulay Foundry Co., was the first president.

C. W. Planje, vice president and general superintendent, central division of Gladding McBean & Co., speaker of the evening, illustrated his talk on "Refractories," with a kodachrome motion picture showing modern plant facilities and operations at that company. According to Mr. Planje, "Careful selection of raw materials and rigid testing and manufacturing controls assure foundrymen of satisfactory fire clay products for all foundry applications." A lively question and answer period followed the talk.—*J. F. Aicher, secretary.*

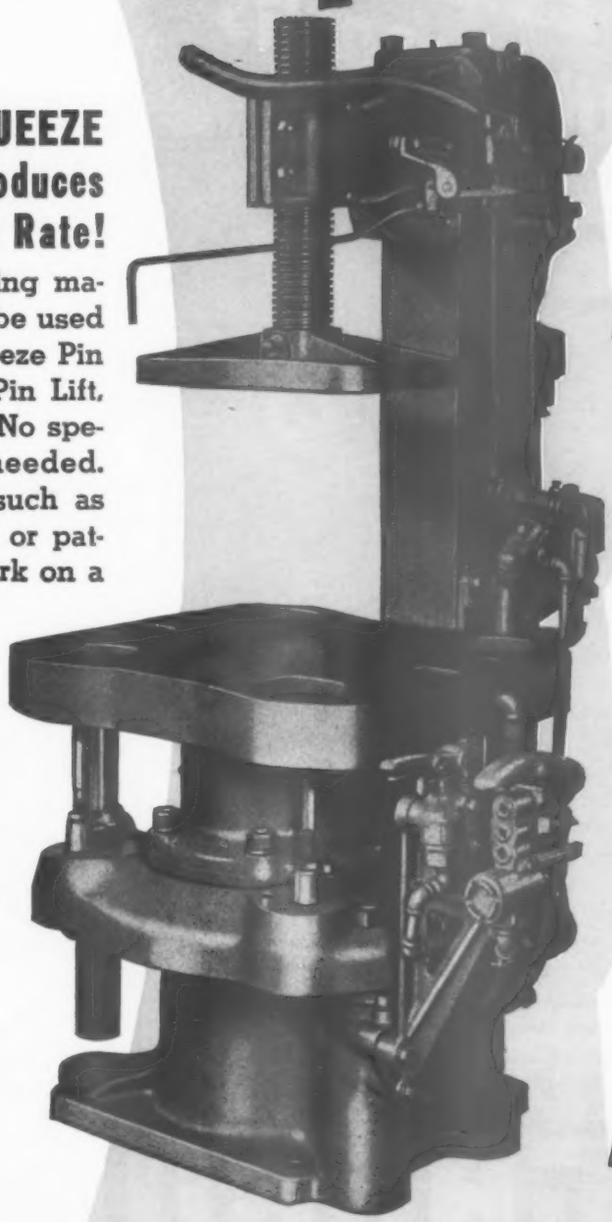
## *Chesapeake*

DUST Control in Foundries" was the subject of a timely and interesting talk presented before the Chesapeake Chapter of the AFA on Oct. 26 at the Engineers' Club, Baltimore, by John M. Kane, chief engineer, Dust Control Division, American Air Filter Co. Inc., Louisville. The speaker showed a series of informative slides illustrating applications of the various types of dust control equipment used for shakeout stations, tumblers, sandblasters, grinders and melting furnaces.

In reply to a question by Dr. Blake M. Loring of the Naval Research Laboratory, Mr. Kane pointed out that a safe dust count would vary from 5 million to 50 million particles per cubic foot of air, depending on the type of sand used and on other operating conditions. Vice Chairman David Tamor of the American Chain

(*Continued on page* 190)

# Speed Up PRODUCTION with this TRIPLE DUTY Molder



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Talk about a versatile molding machine — here's one that can be used three ways — as a Jolt Squeeze Pin Stripper, as a Jolt Squeeze Pin Lift, or as a plain Jolt Squeezer. No special pattern equipment is needed. Handles simple equipment such as patterns mounted on boards or pattern plates. Puts jobbing work on a fast, production basis.

The Milwaukee Jolt Squeeze Pin Stripper has conveniently located valves, is machined to close tolerances, and is accessible from all three sides. Squeeze head construction insures parallelism between pattern table and platen at all times.

*Use it as a* **JOLT SQUEEZE PIN STRIPPER**

*Use it as a* **JOLT SQUEEZE PIN LIFT**

*Use it as a* **JOLT SQUEEZER**

**NOTE:** This versatile molder can also be furnished with adjustable rails with mold roll-off mechanism. Write for further particulars.

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MAKE A BUSINESS OF

CONTROLLING DUST...

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HEALTH & PROFITS

One of the most profitable practices that industrial management can have is controlling dust. For dust that *isn't* scientifically controlled costs heavily in reduced production, soiled, grimy interiors, less efficient lighting, high housekeeping costs, lowered workers' efficiency.

Pangborn engineers, backed by 41 years experience in designing, building and installing the proper dust collecting equipment, have made hundreds of plant surveys of dust conditions in many different types of manufacturing plants. For a soap manufacturer, for instance, where the nature of dust is soap powder, the recommended Pangborn Dust Collecting Equipment has a dust salvage value of $250 a year, assures proper sanitation conditions and reduces plant maintenance costs. For another manufacturer, where the nature of the dust is metallic, the recommended Pangborn Dust Control System saves the company over $8,000 a year.

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PANGBORN CORPORATION · HAGERSTOWN, MD.

(*Continued from page* 188)

& Cable Co., York, Pa., pointed out the desirability of making foundries as clean as possible from the viewpoint of attracting labor in the highly competitive post-war market.

R. Lyons of the Bureau of Ships raised the question of workers being bothered by exposure to drafts while working in dust-controlled grinding booths. Mr. Kane answered that since the velocity of the air moving past the operator is only 100 fpm (less than one mile per hour) no harmful effects would result. A forecast of increasing use of dust control equipment in foundries was made by the speaker in answer to a request by Lt. B. O. Brouk of the Bureau of Ships. Anticipating the ultimate in good housekeeping by foundries, Bill France was anxious to know how soon he could wear a white suit in a foundry and have it stay white.

Members and guests present extended a rising vote of appreciation to Chairman Howard F. Taylor, Naval Research Laboratory, who is leaving to study for his doctor's degree at the Massachusetts Institute of Technology in Boston, and to Jack Menzer and his entertainment committee for the excellent refreshments served before dinner and after meetings, which contribute so much to the informality and good fellowship enjoyed by the chapter.

At the Nov. 23 meeting of the chapter, F. W. Hanson, metallurgist, Electro Metallurgical Co., New York, discussed "Alloys in Gray Iron." Mr. Hanson first pointed out that peacetime consumers would demand that the rapid foundry progress brought about by war production be applied now in order to continue improved mechanical properties, structure, dimensional stability, increased resistance to heat, abrasion and oxidation. The speaker then showed a series of slides dealing with the use of inoculants for the general improvement of gray iron properties.

Vice Chairman Dave Tamor started the discussion ball rolling by asking the speaker the best way to obtain uniform hardness in a casting of varying cross section. Mr. Hanson suggested that the best way would be to add chromium and inoculate with silicon-manganese-zirconium alloy.

A. I. Krynitsky, Bureau of Standards, Washington, discussed with him the effect of superheating the iron and also asked for a comparison of calcium-silicon, ferrosilicon and the silicon-manganese-zirconium inoculants. Mr. Hanson pointed out that each inoculant has certain applications to which it is best suited, but that, in general, the silicon-manganese-zirconium was more powerful

(*Continued on page* 192)

# Each One Matches the One that Tested Perfect

Finding a portable snagging wheel that perfectly suits your requirements . . . and then failing to get those exact specifications duplicated on repeat orders . . . is a nuisance that wastes time and affects quality of work.

That's why so many firms have changed over to Bay State. An exclusive method of controlling porosity for fast, cool cutting . . . and special Bay State resinoid or vitrified bonds . . . combine to give you exactly the results you want . . . the first time and ever after.

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MOUNTED WHEELS AND POINTS · CUT-OFF WHEELS · INSERTED-NUT DISCS AND CYLINDERS

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CONTROL ASSURES UNIFORM RESULTS WITH
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(*Continued from page* 190)

than the calcium-silicon or the 85 per cent ferrosilicon.

Ens. J. E. Fifield of the Naval Research Laboratory discussed methods of measuring the depth of chill in a chill block and the changes in chill depth caused by varying amounts of inoculant. In answer to a question by E. L. Gabler of the Frick Co., Waynesboro, Pa., the speaker suggested that an 85 per cent ferrosilicon (low aluminum) inoculant be used for casting ⅛-in. to ¼-in. sections of a 3.5 per cent C, 2.5 per cent Si iron, and emphasized that the aluminum content be kept as low as possible.—*Lt. (j.g.) John T. Robertson, USNR.*

## *Chicago*

AT long last, the foundryman is to have for his enlightenment and contemplation a comprehensive book tracing the orgin and growth of the foundry industry. A foretaste of its scope and contents, revealed at the Dec. 3 meeting of the Chicago Chapter of the AFA, serves to whet the desire for complete and studied reading of the work.

Conscious of the dearth of historical information heretofore available to active and prospective foundrymen, and believing such information would be most useful and welcome, Bruce L. Simpson, president, National Engineering Co., Chicago, and treasurer of the Chicago Chapter, set out about a year ago on a laborious collection of data from many sources. This effort, recently completed, has resulted in a manuscript with 200 illustrations providing a most interesting review of the beginning and development of castings.

The material is now being prepared for publication in book form by the AFA under the title "The History and Development of the Foundry Industry."

In prefacing his condensation of the manuscript before the Chicago Chapter, Mr. Simpson declared that the common denominator of all castings is that they are "cast to shape," an idea which has not been capitalized upon or sold as it should have been. Some such idea is needed to interest new blood and encourage it to enter the foundry business.

Obviously, it is impossible to review a historical work in a few paragraphs. so suffice it to say that casting of metal followed man's learning to control fire and to make pottery, the clay used in the latter becoming the first refractory. First metal cast was copper, this about 5000 B. C., probably when a fire banked with copper-bearing ore resulted in the copper melting out. This metal was cast into spear heads in stone molds. Later zinc was added to the copper to give bronze.

The Chinese are credited with develop-

ing the first cupola and melting iron about 700 B.C. The first dated cast iron bears the inscription 500 A.D.First cast steel was produced in India about 500A.D. Use of both metals appears to have died out around 1000 A.D., to be revived many years later. History records that the Egyptains were chiefly molders, and in those early days the so-called lost wax process was used.

From this point, casting, of metals progresses in the hands of the Phoenicians, Greeks, Romans and other peoples. Excellent examples of early castings are to be found in United States Museums, notably the Smithsonian Institute Washington, and Chicago Natural History Museum.

Next regular meeting of the chapter is being postponed from Jan. 7 to Jan. 9, at which time the Chicago section, American Institute of Mining and Metallurgical Engineers, will be host at a joint meeting at the Chicago Bar Association. D. A. Potter, group leader in charge of precision casting, Naval Research Laboratory, Washington, will be the speaker and his subject "Precision Casting."—*Erle F. Ross.*

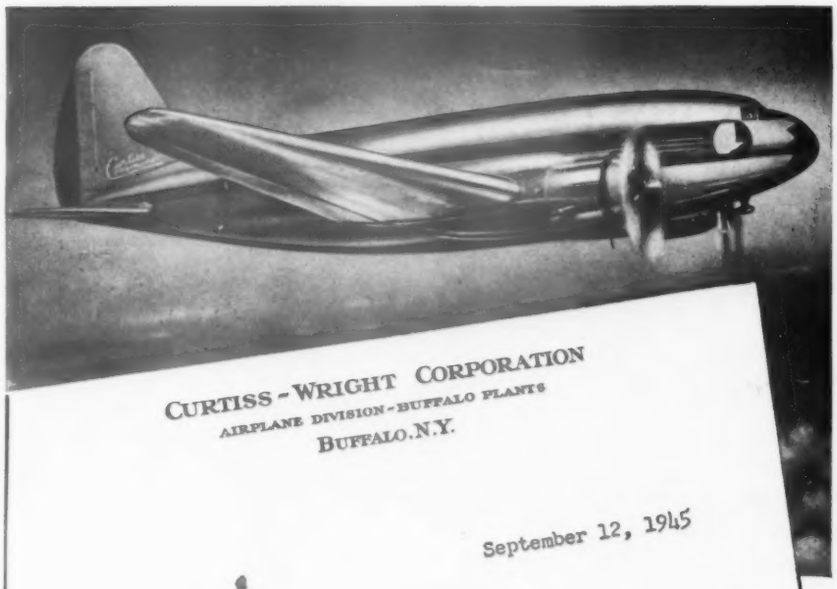
## *New Jersey*

IN AN address on "Industry's Course Under Present Wage Price Policies," Andrew S. Ormsby, industrial member of the New York War Labor Board and industrial relations consultant with 30 years experience in this field, advised foundry managers in Newark, N. J., recently to give more time to the study of government directives, and discussed the technique of union negotiations and of industrial relations in general. He spoke before the New Jersey Foundrymen's Association at the Newark Athletic Club, Nov. 27.

Mr. Ormsby said top management must do a better job, not only in training all supervisors to handle labor relations properly, but in selling them on the importance of this part of the job. The foreman must not only interpret management to the men but also men to the management, and management should consult foremen more fully to determine how contract terms are working out and what changes would be desirable. He also remarked that all men respond to approbation and that it should be given more often.

He thought industry had a good story to tell to its employees and the public and should tell it more effectively. Commenting on collective bargaining, the speaker said that this phase of industrial relations is here to stay and may eventually be made fair by legislation.

E. T. Runge, foundry cost consultant, Cleveland, was present as a guest and

CURTISS-WRIGHT CORPORATION
AIRPLANE DIVISION - BUFFALO PLANTS
BUFFALO, N.Y.

September 12, 1945

Buell Engineering Co., Inc.
70 Pine Street
New York 5, New York

Gentlemen:

It is a pleasure to answer the recent inquiry from your Engineering Department checking upon the mechanical operation of the Buell Dust Recovery Systems installed in our three plants.

Buell Fly Ash Collectors have been in service on twelve (12) boilers since 1941, operating continuously.

Since the time of their installation, they have cost us nothing for maintenance or repair. Their collection efficiency has fully met our requirements, and they have accomplished in a highly satisfactory manner the job for which they were installed.

Yours very truly

Guy Maher

Guy Maher, Plant Engineer
CURTISS-WRIGHT CORPORATION
Plant #2

buell
DUST RECOVERY SYSTEMS

• BUELL DUST RECOVERY SYSTEMS are used throughout industry in the collection or reclamation of many kinds of dust, in numerous production and process operations. Hundreds of satisfied industrial users will attest to Buell's—"High Efficiency, Low Maintenance, Long Life."

*Write for Buell's new, revised book "The Buell {van Tongeren} System of Industrial Dust Recovery" now in its fourth printing.*

BUELL ENGINEERING COMPANY, INC.
14 Cedar Street, New York 5, N. Y.
*Sales Representatives in Principal Cities*

*DESIGNED TO DO A JOB, NOT JUST TO MEET A "SPEC"*

# This•• or THIS

# MOVES TONNAGE

By using narrow aisles—Moving many items at one time—Working 24 hours per day—Tiering materials to ceiling height—Increasing the productive efforts of labor —THE CLARK METHOD makes profit.

Rehandling is easy when THE CLARK METHOD is used—THINK IT OVER.

CLARK Tructractor

BATTLE CREEK, MICHIGAN

Products of CLARK • TRANSMISSIONS • ELECTRIC STEEL CASTINGS AXLES FOR TRUCKS AND BUSES • AXLE HOUSINGS • BLIND RIVETS INDUSTRIAL TRUCKS AND TRACTORS • HIGH-SPEED DRILLS AND REAMERS METAL SPOKE WHEELS • GEARS AND FORGINGS • RAILWAY TRUCKS


said a few words on the importance of sound cost methods.—*Ben K. Price.*

## Saginaw Valley

COKE and By-Products" was discussed by H. E. Baughman, Wheeling Steel Corp., principal speaker at the December dinner meeting of the Saginaw Valley Chapter of the AFA held Dec. 6 at Frankenmuth, Mich.

In dealing with his topic, Mr. Baughman first discussed the selection, sizing and blending of the coals prior to coking. Test methods and equipment for determining the coking characteristics of various coals were described.

Mr. Baughman stressed the importance of selecting the proper size coke for a given size cupola and the importance of care in handling the coke after receiving it to avoid breaking it into smaller sizes. In speaking of cupola operation he pointed out the desirability of controlling the weight of air used and its moisture content to obtain uniformity in iron analysis and characteristics at all times.

Many troubles with cupola iron are the result of using the cupola as an intermittent melting unit to be shut down or started up to take care of all difficulties in the molding department. The speaker emphasized the fact that best results from cupolas are obtained by keeping tuyeres clean and maintaining a steady blast.

The Aluminum Company of America's sound film, "Mine to Metal and Fabricating Process," was shown as an added feature of the evening.—*Joseph J. Clark, reporter.*

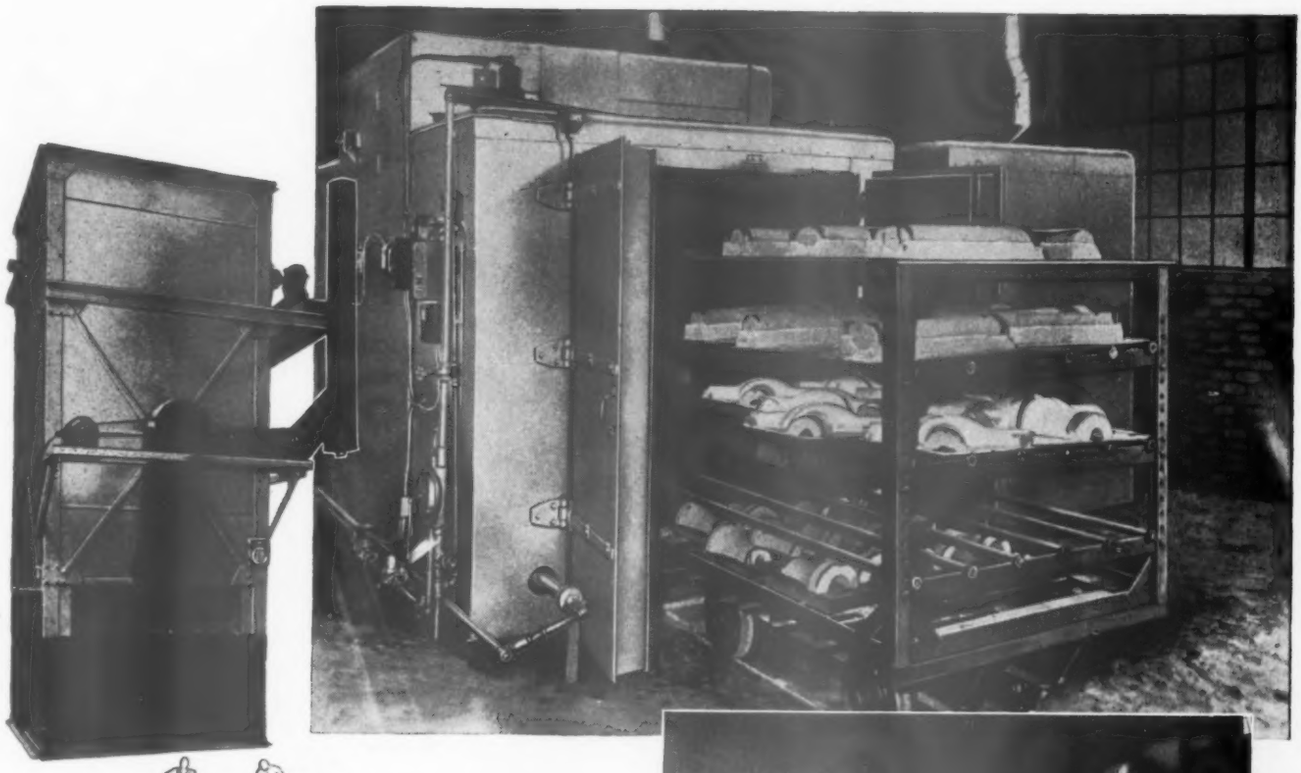
## Canton

THE SECOND of a series of five talks on "Job Relations" was presented by Conrad Traut, the Hoover Co., at the Nov. 29 meeting of the Canton District Chapter of the AFA. Seventy-two members and guests met at the Elks Club in Alliance, O., to hear Mr. Traut discuss "What Is Skill of Leading; How It Affects Your Status; Accomplishing Your Job Through People."

Following the coffee talk, groups assembled for discussion under the following leaders:

Cast iron (cupola practice), Lewis Way, Columbiana Foundry Co.; Steel, I. M. Emery, Massillon Steel Castings Co.; Patternmaking, John Dickerson, the Pitcairn Co.; Nonferrous, M. G. Winters, Winters Foundry & Machine Co.; Time and Motion Study, M. B. Hoffman, Norris Elliot Co.

Next meeting of Canton District Chapter will be at Massillon City Club on Jan. 10, when A. C. Den Brejen, the Hydro-Blast Corp., Chicago, will speak on "Practical Foundry Sand Problems." —*Nils E. Moore, reporter.*



*Experience*

IS THE REAL BUILDER

OF **SUCCESSFUL FOUNDRY OVENS**

Young Brothers' engineering staff offers foundrymen forty years' accumulated experience in the manufacture of continuous core ovens.

This time-proved know-how can be measured in profit dollars and cents, for it is the greatest single factor in the fabrication of efficient industrial ovens.

MEMBER

Lowered fuel costs, low operating costs, higher production, more satisfactory molds and cores and greater oven versatility are all direct results of engineering skill. These factors must be *designed* into the oven and cannot be produced in a poorly engineered oven by any amount of adjustment short of complete redesign.

The economy of Young Brothers' original design is proved by thousands of successful oven installations.

One Young Brothers' customer writes, "Our cost sheet shows your oven is saving us money. We are fully satisfied." Another says, "Your oven is doing a swell job." Still another writes, "... and your oven has cut our unit costs."

Present-day competition makes imperative low cost production. Young Brothers' engineering staff will help you attain it.

**YOUNG BROTHERS COMPANY**

**6508 MACK AVENUE** **DETROIT 7, MICHIGAN**

YB Co

ESTABLISHED IN 1896

# The adventures of BILL

BY PAT DWYER
Drawings By RICHEY

EVERY now and again, which is near enough for any statement that is not essentially vital and important, I come across the familiar quotation: "Give me the making of the songs of a nation, and I care not who makes its laws." That may have been true at the time this celebrated character flourished. He would have to pull in his horns and trim that statement down to a considerable extent if he was responsible for most of the absolute drivel pouring out of the radio north, south, east and west for the past few years. Words are moronic, harmony or melody there is none. The performer—save the mark—apparently suffering intense pain in the last stages of a loathsome and incurable disease, moans and groans his or her way through a kind of recitative chant in which all the words are mumbled out of recognition. All breath and effort are conserved for a final high note, sometimes actually touching *E*, and held for at least seven bars.

When one is alone he can turn the knob, doodad, dingus or hickey on the front of the machine and rest his ears. Unfortunately, one is not always alone. Some member of the group or family insists on listening to Joe Mirando or Penelope Pinkypuss, and all the innocent victims in the vicinity have to suffer in silence. Incidentally, the same is true of other public nuisances, the strange lady who sits at your table and blows cigaret smoke in your face, and the champion offender of all who opens a streetcar window and either smothers you with dust in the summer, or directs a blast of icy air down the back of your neck in winter. The victims calmly endure these unwarranted attacks on their life, liberty and pursuit of happiness guaranteed them under the Constitution. Although perfectly justified by every natural and artificial law, I never yet have seen or heard a person protest the ignorant behavior of the smoker, or seen one rise up and shut a window. One night recently, when the conversation had dwindled almost to the vanishing point, I placed these various subjects on the agenda with a view of getting what the advertising gentry refer to as Bill's reaction and a more or less detailed expression of opinion.

"Well," said this honest yeoman, "I'll tell you. This here now song writing business always has been a racket. Of course the bird who said he would rather write the nation's songs than write her laws, may have meant that the singer had a surer place than the law maker in the hearts of his countrymen, but on the other hand he may have been thinking of the copyright, the royalties, the records, the orchestration and the sheets. With no Jim Petrillo in the background he had a chance to salt away a few barrels of pieces of eight, if he ground out in the mill something that hit the public fancy. Some songs enjoy a long life, but the majority are no more than a flash in the pan, here today and gone tomorrow. If the salvation of your immortal soul depended on the effort, I am willing to wager a small sum, say 2 bits, that you cannot repeat the words of song that was No. 1 in the hit parade two or even one week ago."

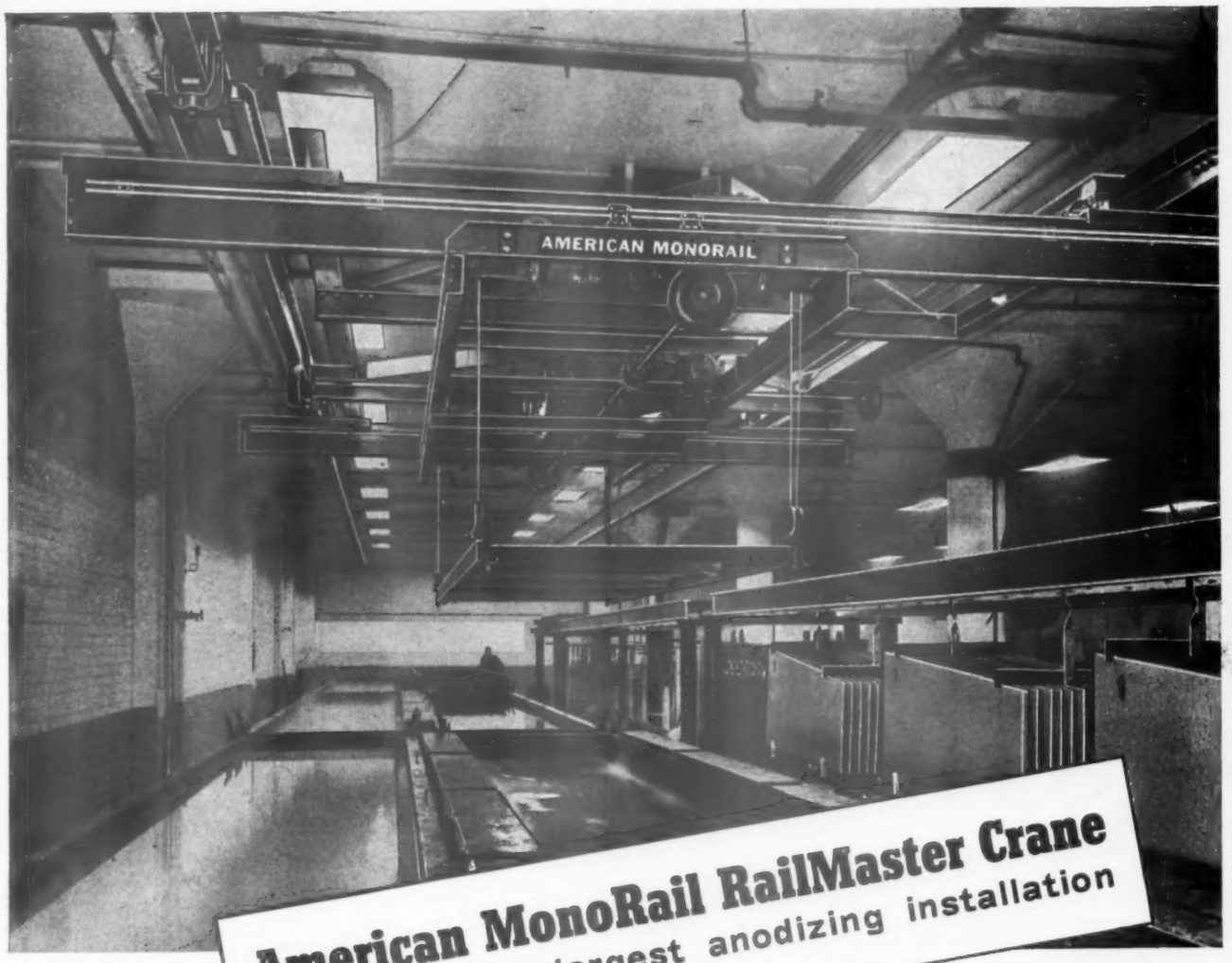
"You are quite safe. I made no attempt to memorize any of the popular hits even when they were dinned into my ears with monotonous regularity from every program between 8 p.m. and midnight. The authors of nearly every one could be arrested if murdering the King's english was an indictable offense. And as for most of the voices, I have heard better coming from the throats of itinerant peddlers crying C-o-o-a-l! Strombay-reez! or Mussels and Cockles, Alive, Alive O!"

"Some songs in the English language—and of course the same is true of songs in other languages—have retained their popularity for a century or more. Only rarely is this owing to the words. The melody has kept them alive. If you examine them closely, in the majority of instances you will find that the words and the composition are no better than the product coming off the present day conveyor belt in tin pan alley."

"Impossible!"

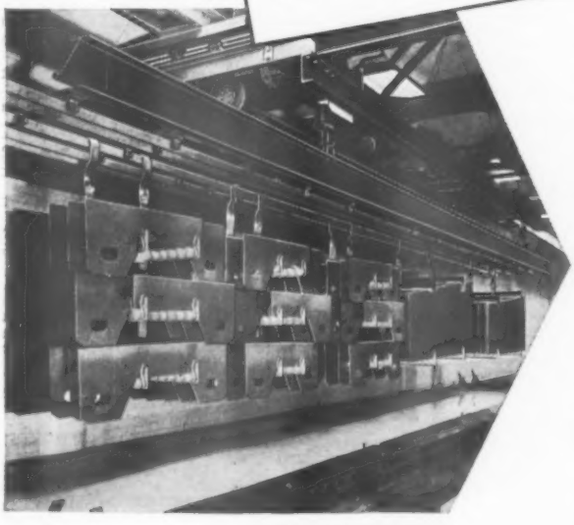
(*Continued on page* 199)

*Annie realizes that while her admirer has a heart of gold, he needs a little brush-up on his anatomy*




Special RailMaster 35' Crane with 2-way tractor drive.

# American MonoRail RailMaster Crane feeds nation's largest anodizing installation



Loaded rack on crane ready for anodizing.

AN American MonoRail two-way drive Rail-Master Crane operates over six tanks that make up one of the world's largest anodizing installations. Special racks loaded with parts are lifted from one to another of five cleansing and rinsing tanks and then deposited into a chromic acid tank where the actual anodizing takes place. Some of the loads weigh as much as 3 tons.

American MonoRail Railmaster Cranes of extremely simple design are developed for handling loads up to 5 tons by manual operation or propelled by rubber wheel drive.

With thousands of installations to draw from, American MonoRail Engineers are well qualified to offer solutions involving overhead handling equipment. Consultation with these men will reveal why American MonoRail equipment was selected to serve the nation's largest industrial plants. This service is offered without obligation — we invite your inquiry.

Send for Bulletin C-1, a 56 page book showing successful applications of American MonoRail systems.

THE AMERICAN MONORAIL COMPANY

13104 ATHENS AVE. ● CLEVELAND 7, OHIO

# PATTERN PLATES AND COPE AND DRAG BOARDS

MADE OF

*Prompt Shipment*

## CARRIED IN STOCK AND DISTRIBUTED BY

**ADAMS & NELSON COMPANY**
4125 Fullerton Avenue, Chicago, Illinois

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**GEORGE F. PETTINOS, (CANADA) LTD.**
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● They stay flat because LIGNOLITE has high transverse strength and resistance to deflection. It is impervious to moisture and does not warp from contact with wet sand or high humidity. LIGNOLITE is half the weight of aluminum, is abrasion proof, of uniform caliper, and may be easily machined, sawed, drilled, tapped. Available in all flask sizes 7/16" to 2" thick or in sheets for own cutting. Write for sample and complete information.

*Mounted LIGNOLITE Pattern Plate*

# MARATHON CORPORATION

**CHEMICAL DIVISION** — **ROTHSCHILD, WISCONSIN**

(*Continued from page* 196)

"Impossible, hey? Take, for example, the old favorite 'Annie Laurie.' The melody has kept it alive. The words are a sorry example of what a poor goop will do and say when he is in love."

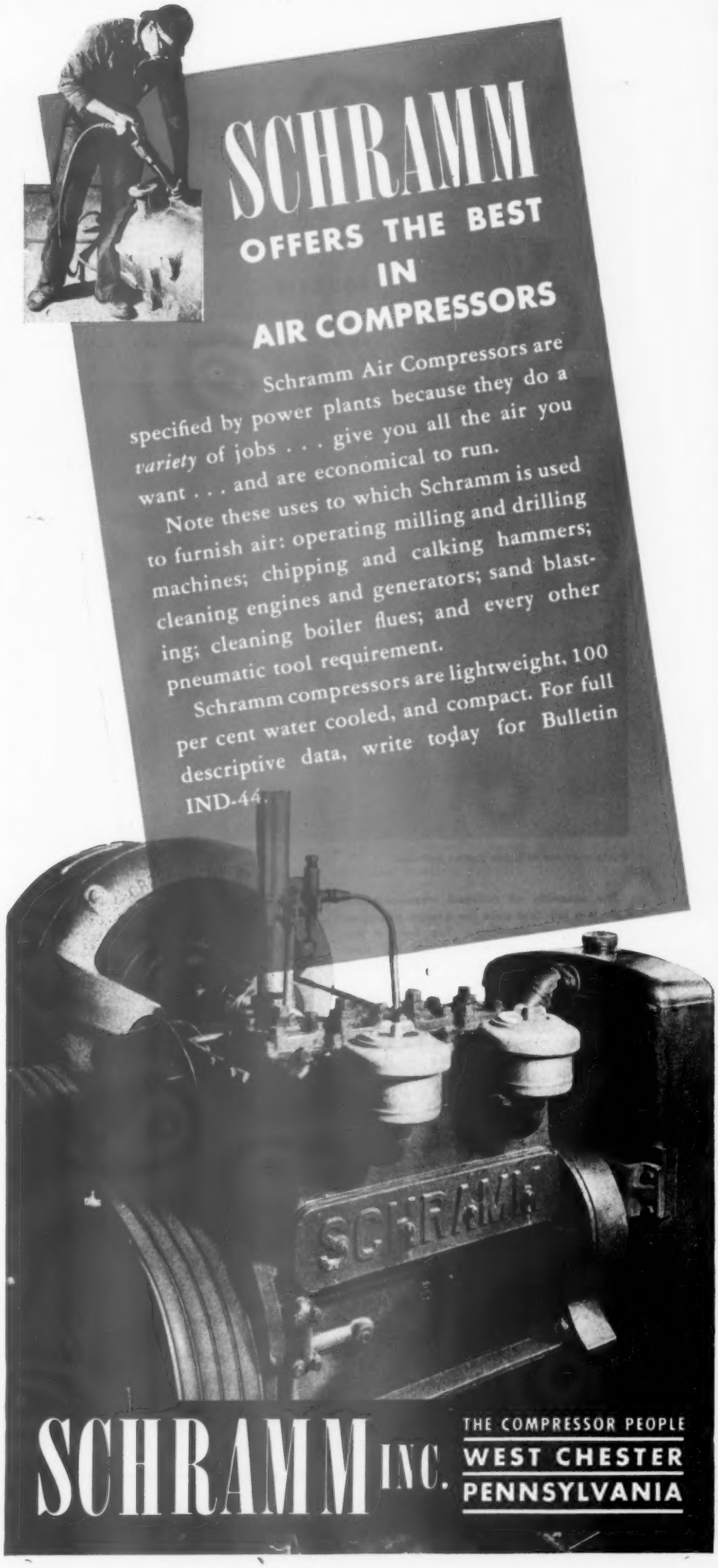
"Have you ever read *Song of The Camp*, by Bayard Taylor?"

"No, I can't say that I ever have. But what has Brother Taylor to do with Annie Laurie?"

"Listen, my dear and you shall hear what Mr. Taylor has to say about an incident in the Crimea war when the English with right hostile intent tried to take a fort away from the Russians: 'Give us a song' the soldiers cried, the outer trenches guarding, when the heated guns of the camps allied grew weary of bombarding. The dark Redan in silent scoff, lay grim and threatening under, and the tawny mound of the Malakoff no

*He learns to count up to ten*

longer belched its thunder. There was a pause. A guardsman said 'We storm the forts tomorrow. Sing while we may, another day will bring enough of sorrow.' They lay along the battery's side, below the smoking cannon, brave hearts from Severn and from Clyde and from the banks of Shannon. They sang of love and not of fame; forgot was Britain's glory; each heart recalled a different name, but all sang 'Annie Laurie.' Voice after voice caught up the song until its tender passion rose like an anthem rich and strong, their battle eve confession. Dear girl, her name he dared not speak, but as the song grew louder, something upon the soldier's cheek washed off the stains of powder. Beyond the darkening ocean burned the bloody sunset's embers, while the Crimean valleys learned how English love remembers. And once again a fire of hell rained on


SCHRAMM
OFFERS THE BEST
IN
AIR COMPRESSORS
Schramm Air Compressors are specified by power plants because they do a *variety* of jobs . . . give you all the air you want . . . and are economical to run.
Note these uses to which Schramm is used to furnish air: operating milling and drilling machines; chipping and calking hammers; cleaning engines and generators; sand blasting; cleaning boiler flues; and every other pneumatic tool requirement.
Schramm compressors are lightweight, 100 per cent water cooled, and compact. For full descriptive data, write today for Bulletin IND-44.
SCHRAMM INC.
THE COMPRESSOR PEOPLE
WEST CHESTER
PENNSYLVANIA

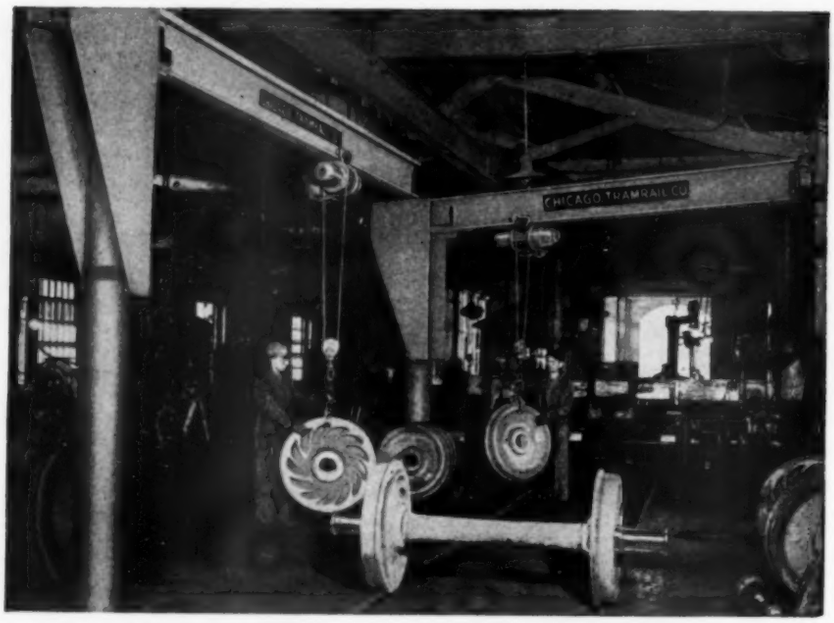
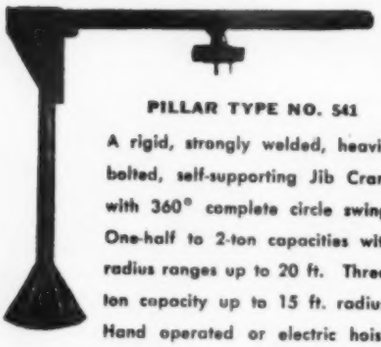



Photo courtesy of Union Pacific Railroad

The assembly of railroad wheel-and-axle units is a job that calls for precise coordination in heavy handling. Too light a job for costly overhead cranes, and too dangerous for all but the most skilled manual labor, it is an ideal application for fast-action, flexible Jib Cranes. Working in conjunction, the two nimble Jib Cranes ease the wheels into place on the axle swiftly and surely, without danger to the delicate bearing surfaces of the axle or journal. This used to be a job for skilled workmen, but now easy-to-operate Jib Cranes take over the difficult task—a real help in the labor-scarce times.

Jib Cranes help to reduce compensation costs because they lessen the probability of accidents that are so frequent in heavy handling. For example; the operation above was formerly a dangerous one. Many strains and broken bones resulted from rolling the heavy wheels into position, but now the men have only to guide the free-swinging Jib Cranes as they swing around, pick up the wheel and carry it to the point of assembly.



**PILLAR TYPE NO. 541**

A rigid, strongly welded, heavily bolted, self-supporting Jib Crane with 360° complete circle swing. One-half to 2-ton capacities with radius ranges up to 20 ft. Three-ton capacity up to 15 ft. radius. Hand operated or electric hoist.

**IN YOUR PLANT**

It's easy to see how swiftly, economically and safely Jib Cranes perform the operation illustrated. You can effect these same savings in your plant through the use of Jib Cranes. Look around your plant—you're sure to see many places where the use of these sturdy "mechanical muscles" will save you time and money as well as speed up production. Write for full particulars today. We will be glad to send you an illustrated circular showing the various types of Chicago Tramrail Jib Cranes together with many suggested applications for their use.

***WRITE TODAY!***

**CHICAGO TRAMRAIL COMPANY**

2910 CARROLL AVE. Phone KEDzie 7475 CHICAGO 12, ILL.


the Russian quarters, with scream of shot and burst of shell and bellowing of mortars. And Irish Nora's eyes are dim for a singer dumb and gory, and English Mary mourns for him who sang of Annie Laurie. Sleep, soldiers! Still in honored rest your truth and valor wearing, the bravest are the tenderest —the loving are the daring."

"Very good," Bill admitted. "Bro. Tayor is a master hand at stringing the words together. 'Tis a great pity the author did not call him in when he or she was composing 'Annie Laurie.' 'Maxweldon's braes are bonnie where early fa's the dew, an' twas there that Annie Laurie gied me her promise true. Gied mé her promise true, which ne'er forgot will be and for bonnie Annie Laurie I wad lay me doon and dee.'

"Who cares whether Maxweldon's braes are bonny or not? The only point of importance is that our hero displayed remarkably poor judgement in walking Annie around the braes while a heavy dew was falling. She would get her feet soaking wet, probably develop pneumonia and run a greater danger of passing out of the picture than this lad who insists on winding up each of the three verses with the silly statement to one and all that he was willing to lay doon and dee. So far as one may gather from the entire composition, no person wanted him to dee, therefore why should he keep harping on that phase of the subject? In one line he says she gied him her promise true and in the next line he wants to go away and die. This opens up a line of speculation on the character of the promise. The natural inference is that she promised to marry him, but that would be only a charitable guess.

There is not a word of marriage, ring or lines from beginning to end. Not so good. There is a possibility that she promised him a kiss, her company at the next village dance, a bushel of seed potatoes from her father's special collection, or a pup from the first litter expected any day now in the old red barn. Dash it all, this song writer should have been more explicit. Maybe she promised to go to his funeral, if this melancholy event was not scheduled for a rainy day, or during a driving snow storm in the dead of winter. Maxweldon's braes are no garden of Arcady when the wild north wind, laden with glass hard snow particles originating in the wastes of the Arctic seas come whistling down from the Grampian hills.

"'Her brow is like the snawdrift, her throat is like the swan, her face it is the fairest that e'er the sun shone on. That e'er the sun shone on and dark blue is her ee and for bonnie Annie Laurie I

(*Continued on page* 202)

# 8th ADVANTAGE...

# NOT WET BY MOLTEN METAL!

IMAGINE!—1500 steel ingots on graphite stool inserts in one plant—*without any stickers!* That's because molten metals simply do not stick to carbon or graphite!

This eighth advantage of "National" carbon or graphite is only one of many responsible for the adoption of these materials by the metal-working industries, in the form of stool inserts, mold plugs, molds, mold wash (graphite powder), run-out troughs, and furnace linings. Another advantageous feature in run-out troughs and furnace linings: the carbon blocks are unaffected by the most corrosive slags.*

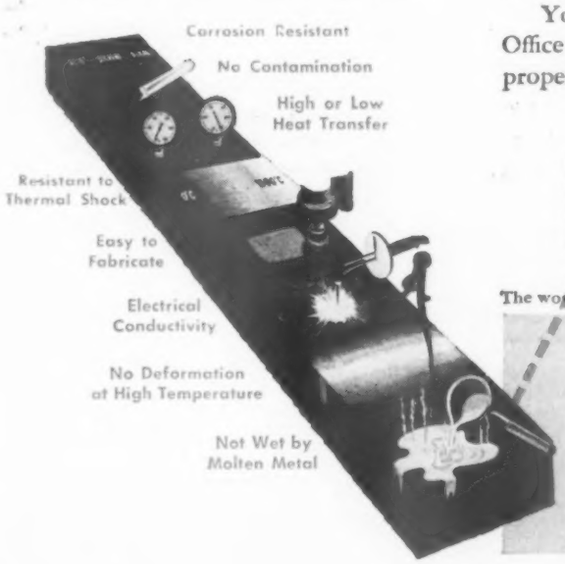
You are invited to get the full story . . . from our nearest Division Office . . . on carbon's, or graphite's, truly remarkable *combination* of properties, whether in the ordinary, porous, or impervious forms.

***Chemical Engineers Please Note**

Of parallel importance to the chemical industries are other advantages of "National" carbon and graphite and "Karbate" impervious materials. They are resistant to the corrosive action of most acids, alkalies, and solvents, and they do not contaminate solutions.

**BAR OF WHAT?**

Carbon, Graphite, or "Karbate" materials, of course!




The words "National" and "Karbate" are registered trade-marks of National Carbon Company, Inc.

**NATIONAL CARBON COMPANY, INC.**

*Unit of Union Carbide and Carbon Corporation*

UCC

*General Offices:* 30 East 42nd Street, New York 17, N. Y.

*Division Sales Offices:* Atlanta, Chicago, Dallas, Kansas City, New York, Pittsburgh, San Francisco

# NEW and UNIQUE! » THE CARTRIDGE BENCH CORE BLOWER

*Users report remarkable increases in quality and quantity of production

Produces variety of intricate cores with unusual speed and simplicity.

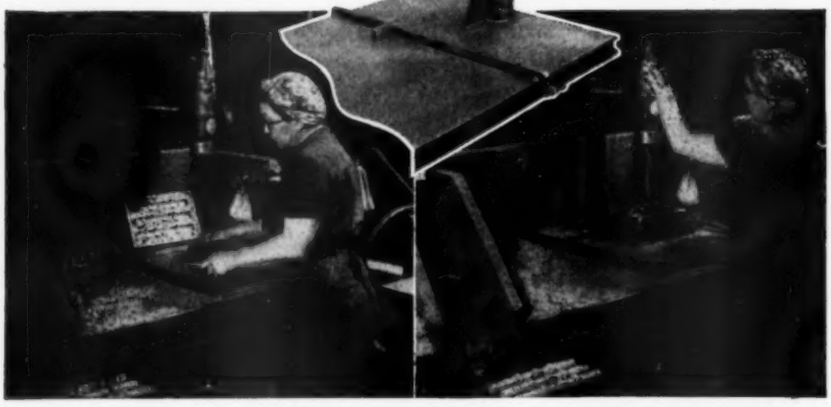
Comes ready to use—virtually no installation cost.

Can be operated with unskilled labor—extremely easy to use.

If you make cores 2 lbs. or under—this unit ideally suited to your use.

Designed by two practical foundrymen.

*WRITE* for complete details and new booklet



Core boxes can be made very light, in most instances bench equipment now used can be converted for blowing. Almost any sand now commonly used on the core bench may be used for blowing cores. Adjustment for boxes of different height, size and shape made instantly.

To operate, core box and cartridge are held down by pressure handle while left hand operates blow valve. After core has been blown, the box is pulled forward and cartridge is lifted off and the work of drawing core is completed on base of machine.

## FILLS NEED FOR SIMPLE, FLEXIBLE CORE BLOWER

The New *Redford Cartridge Bench Core Blower* has met with enthusiastic acceptance by foundrymen because it supplies an important need in the foundry for an efficient, low-cost method of blowing small, intricate cores. It requires no large volume of air and readily lends itself to handling a variety of core boxes. In fact, they tell us that it is the ideal method of making cores in single or gang boxes requiring a maximum of 2 lbs. of sand.

*SAND CARTRIDGES AVAILABLE IN 8 STANDARD SIZES*

Blower comes complete, ready to use. Each blower provided with one Size "C" sand cartridge which is adaptable to a large range of core boxes. Cartridges are available in seven additional standard sizes and special sizes furnished where needed.

★ Cartridge Bench Core Blowers

**Redford IRON & EQUIPMENT CO.**

Phone: REdford 8610

21315 West McNicholls Rd. Detroit 19, Michigan


(*Continued from page* 200)

wad lay me doon and dee.' With a hundred objects of comparison available the singer lights in a snow drift up to his neck. After last winter's experience around these here parts, if I never see snow again it will be too soon. The snow in Scotland may be white, but if Annie's face was the color of the stuff lying around here knee deep, she would have some difficulty persuading the immigration inspectors that she came from pure Aryan stock. 'Na,na, ma lass' says old lynx eye. 'Ye may claim ye'er Annie Laurie, but ah think ye are either a Hottentot or a Maori.' Under these circumstances the singer would have a proper excuse to go out and die, and a fat lot of good that would do either him or her.

"'Her throat is like the swan.' Presumably he is referring to the swan's throat. It is inconceivable that he was giving her the complete bird, a graceful enough creature in the water, but probably the most ungainly, awkward lump of animation that ever stumbled over the land on two big, flat feet. Since the lady's feet are touched upon with proper reverence in the third verse it is only fair to ignore the swan's underpinning and get along with the work."

"Work, says he. Ha!"

"Anything that involves severe physical or mental effort is work. You would not know anything about that, but let it go. Let's see, where was I? In all the fashion books and other reliable sources of information, a long, gracefully curved neck line is given proper recognition and appreciation. However, in my humble and amateur opinion, there should be a reasonable limit. A good, healthy swan has a neck about as long as an old time stove plater's wooden rammer, with a carefully polished brass peen and butt and a screw and socket in the center so that it might be folded and carried in the canvas grip with the trowel, the double ender, the yankee slick and the other shirt. Here the resemblance ceases. In addition to the length, the bird's neck can be twisted into more curves than a pretzel. The lady apparently had a fairly long neck, but this swan stuff is pure baloney. In our charity we may make allowance for the hero cutting it rather thin, but it is still the old reliable.

"The bare unadorned statement that her face was the fairest that e'er the sun shone on, to say the least, is open to question. It is only one man's opinion. One might pardon the singer's enthusiasm and naivete if he had confined himself to the local and limited home front, but the pictures of beauty queens staring out of practically every newspaper page,

(*Concluded on page* 204)

# Famous Cupola Flux

## Helps you produce THE BEST CASTINGS!

When iron is right, casting structure is right.

By tossing a little Cornell Flux into your cupola you cleanse the iron and make it more fluid. Castings come denser grained, stronger, cleaner and are more easily machined.

Famous Cornell Cupola Flux also keeps cupola clean, protects life of brick in melting zone, gives cupola a clean drop, and cuts maintenance to rock bottom.

*Write for NEW BULLETIN*

Takes but a few seconds to use. *Promotes accurate measurement.* You simply toss in one brick or break off a briquette (quarter section) for each 500 pound charge of iron in the cupola. None blows out with the blast—it *stays* in melting zone until *entirely* consumed.

**The CLEVELAND FLUX Company**

**1026-1036 MAIN AVENUE, N. W., CLEVELAND 13, OHIO**

*Manufacturers of Iron, Brass and Aluminum Fluxes Since 1918*

FAMOUS CORNELL FLUXES Trade Mark Registered

**Write for Bulletins ➡**

### Famous CORNELL ALUMINUM FLUX

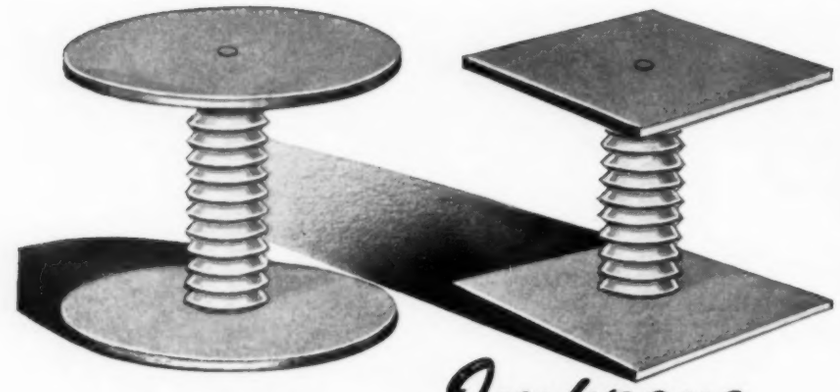
Produces clean, tough castings. No spongy or porous spots even when more scrap is used. Thinner yet stronger sections are poured. Castings take a higher polish. NO FUMES! Exclusive formula prevents obnoxious gases. Metal does not cling to dross.

### Famous CORNELL BRASS FLUX

Makes metal pure and clean, even when dirtiest brass turnings or sweepings are used. Produces castings which withstand high pressure tests and take a beautiful finish. Saves considerable tin and other expensive metals. Crucible and furnace linings are preserved.

### Famous CORNELL LADLE FLUX

Place a few ounces in bottom of ladle, then tap cupola. Metal is thoroughly cleansed, foreign impurities are easily skimmed off. Ladles are kept clean, there is less patching and increased ladle life. Metal temperatures are retained during transfer to molds.



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(*Concluded from page* 202)

queens selected at every rally where a dozen or more women are present, would seem to indicate that Annie's champion is taking in too much territory. Also if my own personal experience is of any value I might say that a few bobs laid out in entertainment Saturday night would make a more agreeable impression on the lady, than the offer to creep away some place and dee.

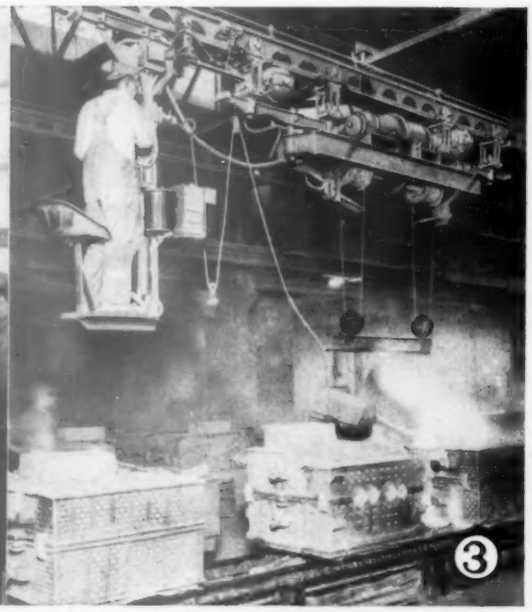
"A hasty glance at the line 'And dark blue is her ee' easily might convey the impression that the lady had only one eye. Right or left not specified. Possibly the other eye might have been black, brown, gray, green, bloodshot or set at an acute or obtuse angle and naturally the hero would not care to dwell on that particular feature. The possibility of course exists that she had two good eyes, but the author, a member in good standing of Local 46, National, Independent and Protective Poets Union, had to use a word that would rhyme with dee. The author probably depended on the well known fact that singers pay little or no attention to the words. Reminds me of a local radio announcer who came across the—to him—unknown word ewe in his script. He boldly pronounced it ee-wee. His vocabulary is on a par with that of the lad who wanted to dee.

" 'Like dew on the gowan lying is the fa' of her fairy feet, like winds in the summer sighing, her voice is low and sweet. Her voice is low and sweet and she's all the world to me and for bonnie Annie Laurie I wad lay me doon and dee!' Here is another example of the careless use of words. Presumably the lady wore boots, shoes, slippers, moccasins, brogans, waders or some form of foot covering. After the elaborate buildup one hardly can imagine her skipping about among the heather and thistles in her bare feet. As a plain matter of fact—"

"As a plain matter of fact," I interrupted, "you are talking through your high Caroline hat. I trust you will not attempt to improve the 'Song of The Camp.' "

"No," Bill admitted soberly. "That is the real, simon pure, genuine, blown in the bottle sentiment that constricts the throat and tugs at the heart strings. 'They sang of love and not of fame, forgot was Britain's glory, each heart recalled a different name, but all sang Annie Laurie . . . And Irish Nora's eyes are dim for a singer dumb and gory, and English Mary mourns for him, who sang of Annie Laurie."

He shook his head and blew his nose in an old red handkerchief I had not seen since the boys marched away several years ago.



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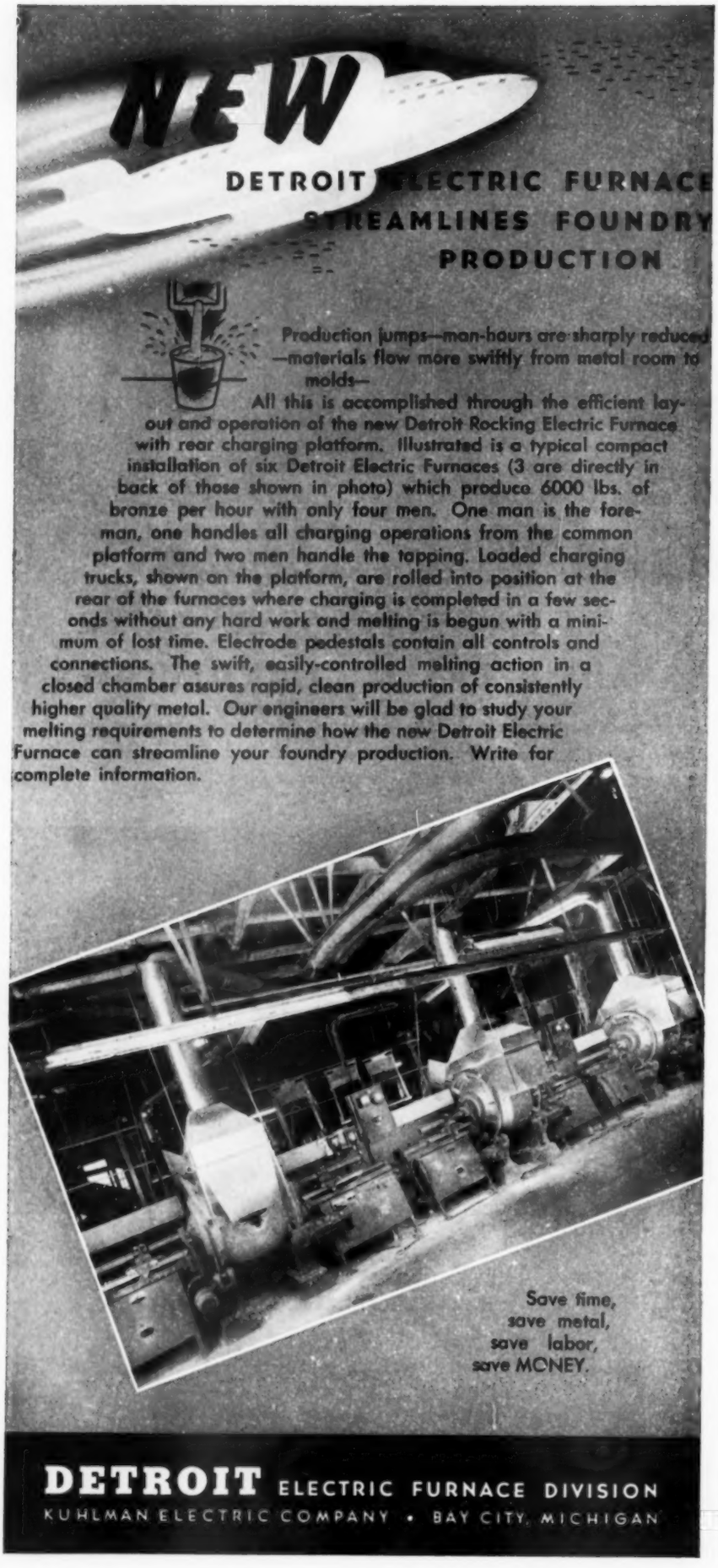
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Production jumps—man-hours are sharply reduced
—materials flow more swiftly from metal room to molds—
All this is accomplished through the efficient lay-out and operation of the new Detroit Rocking Electric Furnace with rear charging platform. Illustrated is a typical compact installation of six Detroit Electric Furnaces (3 are directly in back of those shown in photo) which produce 6000 lbs. of bronze per hour with only four men. One man is the fore-man, one handles all charging operations from the common platform and two men handle the tapping. Loaded charging trucks, shown on the platform, are rolled into position at the rear of the furnaces where charging is completed in a few sec-onds without any hard work and melting is begun with a mini-mum of lost time. Electrode pedestals contain all controls and connections. The swift, easily-controlled melting action in a closed chamber assures rapid, clean production of consistently higher quality metal. Our engineers will be glad to study your melting requirements to determine how the new Detroit Electric Furnace can streamline your foundry production. Write for complete information.
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save metal,
save labor,
save MONEY.
DETROIT ELECTRIC FURNACE DIVISION
KUHLMAN ELECTRIC COMPANY • BAY CITY, MICHIGAN


# MAGNESIUM CAPACITY UP SHARPLY

(*Continued from page* 91)

at the elevated superheating temperature than at the lower pouring temperature. Iron has a deleterious effect on the corrosion resistance of magnesium alloys, and is objectionable for this reason.

Research has shown that grain refinement equivalent to that obtained by superheating may be obtained by inoculating the melt with carbon. The carbon may be introduced into the melt in a variety of ways and is effective at the usual pouring temperatures, thus eliminating the need for superheating. An especially convenient method for bringing the carbon into contact with the melt is in the form of carbon tetrachloride introduced into the fluxing chlorine gas stream. The chlorine may be bubbled through the liquid carbon tetrachloride, which is maintained at a controlled temperature to permit the desired amount of carbon tetrachloride vapor to be swept into the melt. In this manner, fluxing, degassing, and grain refinement are accomplished in one effective operation and with little effort. The metal is then ready to pour.

### Flux Cover Not Needed

For cold-chamber die castings and certain permanent mold castings, very small additions of beryllium have been found to inhibit the oxidizing tendencies of molten magnesium alloys so they may be melted and held without a flux cover at low temperatures. This permits metal to be dipped from the pot and poured without the danger of introducing flux inclusions into the castings.

Another development which has coincided with the war period has been the application of synthetic resins as core binders in the magnesium foundry. Magnesium alloys have a low heat capacity, low density, and are poured at a relatively low temperature. Consequently, the binder must be such as to permit the core to collapse readily, in order to prevent hot cracking of castings and difficult shake-out of cores. Cores for magnesium castings also contain inhibitors which volatilize readily. The low baking temperature and short time required for curing of resin-bonded cores minimizes the loss of inhibitors from the cores and, since the resin bond is destroyed at the temperatures developed during the pouring, the core collapses readily.

Many foundries now use resin-bonded cores for all of their work. At one time

(*Continued on page* 208)

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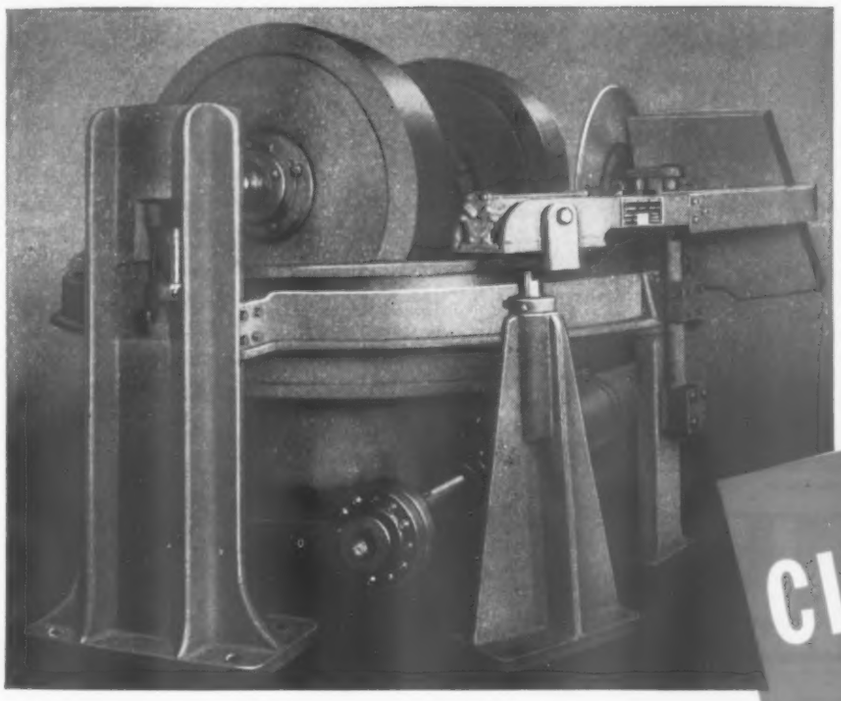

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(*Continued from page* 206)

there were objections to the use of resin binders on the basis that the mixes were hard to handle in the coreroom. Resin-bonded sand tended to stick to the corebboxes and coreblowers would plug frequently. However, new synthetic-resin binders are now on the market which overcome these objections, and are easy to handle.

It has been less than 20 years since the methods for casting magnesium in green sand have become known. Previously, it was necessary to pour magnesium in permanent or baked sand molds, because magnesium would react violently with the water present in green-sand molds. Materials such as sulphur, boric acid, ammonium silicofluoride, ammonium borofluoride, and others were found to inhibit the reaction with moisture in the sand, so that pouring magnesium in green sand molds became practical.

Synthetic molding sands, consisting principally of silica sand and bentonite, have had wide usage during the war. These sands have the high permeability desirable for magnesium, and may be worked at lower moisture contents than natural sands. They are also freer from the organic materials which promote blow holes.

### Sand Has Low Moisture

Humectants, such as ethylene glycol and diethylene glycol, have been generally accepted during the past few years for green-sand additions. These materials permit synthetic sands to be worked satisfactorily at moisture contents as low as 1.5-2.0 per cent, and prevent drying of the sand in hoppers or at corners and edges of molds. Because less tempering water is used with humectants, less inhibitors are required to be added to the sand.

As aircraft production increased, the number of any one casting required increased to the point where permanent molds became feasible. Permanent mold castings have advantages over sand castings in that closer tolerances may be maintained and casting surfaces are better and require less finishing. Use of permanent molds for producing magnesium castings increased considerably during the war.

To produce the highest quality castings, it is necessary for the molten magnesium metal to be introduced into the mold with a minimum of turbulence. Bottom gating is almost a necessity for this reason, yet the proper temperature gradients must be set up for directional solidification in order to ensure proper feeding and soundness in the casting.

In some foundries, perforated sheet metal screens are incorporated in the gating system to trap dross. These screens

(*Continued on page* 210)

# KNOW IN ADVANCE HOW YOUR SAND WILL BEHAVE AT METAL POURING TEMPERATURES

**THE HITEMP DILATOMETER** helps you determine the causes of such defects as rat tails, scabs, buckles, fissures, veining, hot tears, metal penetration, oxide penetration, blows, dirt inclusion and cuts.

**Accessories provided to conduct the following tests:**

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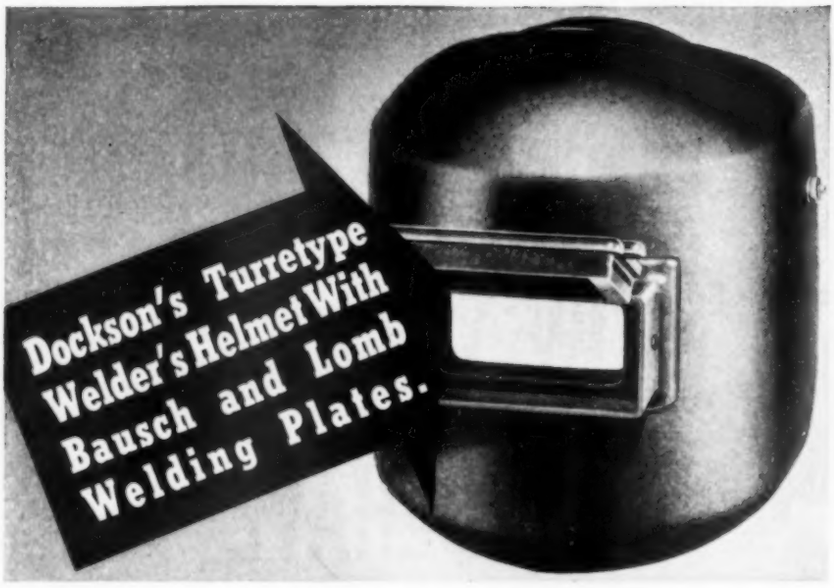


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(*Continued from page* 208)

must be so placed to avoid breaking up the metal stream into droplets, and also must be designed so that as the holes plug with dross, the screen does not become a choke. Assuming a sprue area of 1, runners should have a comparative area of 2, screens from 6 to 15, and gates 4, to permit smooth flow and uniform pouring.

Ingenious gating systems have been evolved which permit bottom pouring and still allow the hottest metal to flow into the risers. Cross gates from the sprue to the rise are an example of this, but the so-called fin gating is even more effective. In this system, the downward flow of metal in the sprue is reversed by a smoothly curved runner at the low point in the mold. The portion of the runner extending upward is connected to the casting by a continuous vertical fin (knife) gate which allows the hottest metal to flow progressively over the metal already in the mold, thus finally having the hottest metal in the riser and the coolest metal toward the bottom of the casting. The fin-gate method sometimes makes the construction of patterns and coreboxes more difficult, and may increase the molding difficulties. However, the increased yield of sound castings usually more than balances these deficiencies, provided the design of the casting lends itself to this method of gating.

### Use High and Low Zinc Alloys

Comparisons of the high-zinc alloys (2 and 3 per cent) with the low-zinc alloys (0.5 per cent) have shown that use of the low-zinc alloys will also contribute greatly to improved soundness of the castings without a serious sacrifice in resistance to salt water corrosion. These latter alloys have had only limited use during the war, wider use being left to postwar developments.

All of the highly stressed aircraft castings made by magnesium foundries during the war have been subjected to the most rigorous inspection before leaving the foundry. Test bars are poured from each melt, and the bars are heat treated along with the castings. Many castings undergo 100 per cent x-ray inspection, which may mean up to 100 views for each casting. Usually, as the casting becomes developed properly, only a portion of each day's production is x-rayed, or each casting may be x-rayed only in the most critical areas. Certain castings are subjected to pressure tests for soundness if they are to be used where the requirements are retention of liquids or gases. Some castings are broken each day after heat treatment for an examination of the fracture and to obtain metallographic specimens.

(*Concluded on page* 212)

# *Melting* NON-FERROUS METALS

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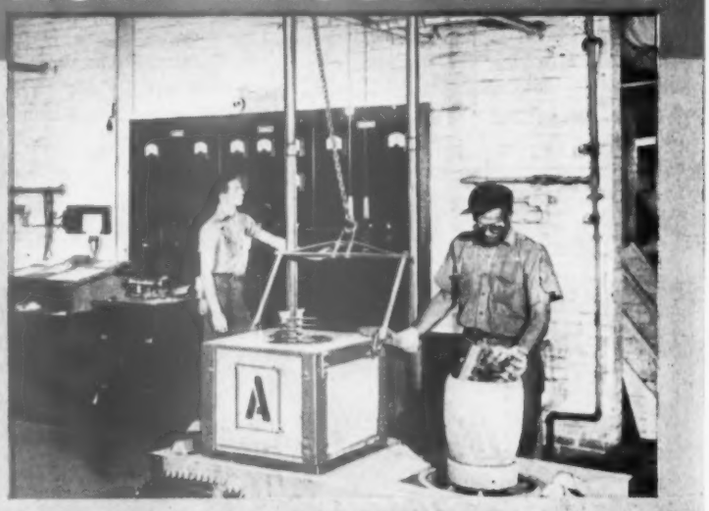
**SAFE**



## *with* AJAX-NORTHRUP

**Has the war made your engineers and customers "fussy" about alloy specifications? Has it taught them to base their designs on the higher physical properties of closely controlled alloys?**

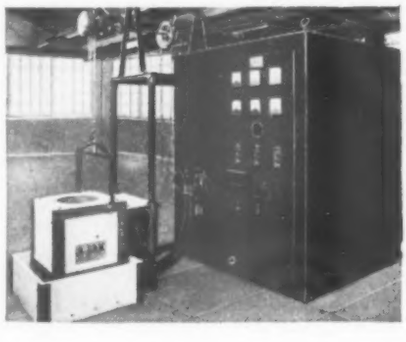
**If so, you'll need the rapid melting, close control, stirring action and freedom from contamination of Ajax-Northrup melting.**

**It is particularly good for tough-to-handle melts such as high-copper bronzes. There is no risk of contamination, and scrap recovery is extremely high. Melt after melt is exact in analysis. High-frequency melting also saves on the cost of machining parts which are later rejected because of casting flaws.**

**The Ajax-Northrup furnace fits right into present foundry practice, and takes little space on the pouring floor. With the lift-coil furnace (shown above) the charge is melted in a crucible, which can be picked up in a shank for pouring. Change-over from one alloy to another is quick, and pot life is long. Tilting-coil type furnaces can be poured directly into the molds, or into crucibles or ladles. *Send for new bulletins on Ajax-Northrup ferrous or non-ferrous melting.***

### FOR SMALL FOUNDRIES

***This new, self-contained Ajax-Northrup melting unit is ideal for small non-ferrous foundries. Lift-type furnace coil fits No. 70 pot, melts 200 lbs. of brass in 50 minutes with 50 kw., or in 25 minutes with 100 kw. Compact, simple to control, cool working conditions.***



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A S S O C I A T E
C O M P A N I E S

(*Concluded from page 210*)

This examination allows a check to be made on metal quality, soundness, and heat treatment. Castings are placed in humidity chambers at regular intervals to show whether flux inclusions have been eliminated. Complicated and expensive qualifying jigs are used for checking the various dimensions of the castings. In some instances, repair of small defects by helium-arc welding is permitted. This method of welding magnesium alloys, in which the electric arc is surrounded by inert helium gas, is a wartime development and produces very excellent welds.

From the foregoing description of developments in magnesium foundry practice, it must not be assumed that magnesium practice is so difficult and involved that it is next to impossible to produce a casting. When the proper techniques are used, ordinary magnesium castings are as easily made as castings of any other metal. The casters of the older metals would be required to exert equal precautions in making some of the complicated, highly stressed castings assigned to the magnesium foundry to produce during the war.

Many of the practices developed for casting magnesium may be applied to advantage in casting other metals. For example, the use of humectants in synthetic sands should make these sands easier to handle in a steel, bronze, malleable, gray iron, or aluminum shop. The value of inhibitors in sands for use with certain ferrous and nonferrous metals other than magnesium is just becoming appreciated. Synthetic-resin core binders should find applications in many other foundries. Methods of gating magnesium castings to avoid turbulent flow of metal into the molds, and to promote directional solidification, should produce better castings in other metals. The important role played by the foundry metallurgist, with good metallurgical and chemical control laboratories and inspection equipment at his disposal, in producing high-quality magnesium castings should be well-noted by producers of castings of other metals.

Some foundries that cast magnesium during the war will reconvert to their peacetime products, but certainly it can be said they have become more skilled in the art and science of the foundry through their production of magnesium aircraft castings. Many more than the prewar number of foundries will continue to cast magnesium.

**Sources of Illustrations**

Figs. 1, 4, 5, 6—American Magnesium Corp., Pittsburgh.
Fig. 3—Dodge Chicago Plant, Division of Chrysler Corp., Detroit.
Fig. 7—Allison Division, General Motors Corp., Detroit.
Fig. 8—Doehler-Jarvis Corp., New York.

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## Metal Show To Have Full Program

Plans for the National Exposition to be held in Cleveland during the week of Feb. 4 rapidly are being completed. Sponsored by the American Society for Metals in conjunction with the American Industrial Radium and Radiograph Society and the American Welding Society, attendence at the meeting is expected to exceed those previously held. Headquarters of the American Society for Metals will be at Hotel Statler. Technical sessions to be held during the first three days by the society include presentation of 31 papers while four lecture courses on magnesium, induction heating, surface stressing and corrosion will be given on the two remaining days.

Headquarters of the American Industrial Radium and Radiograph Society will be at Hotel Hollenden, and its technical sessions will be held on Feb. 6, 7 and 8. American Welding Society's headquarters will be at Hotel Cleveland. The exposition is expected to be the largest industrial show ever held, exceeding the previous one by 25 per cent.

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# MALLEABLE INDUSTRY IMPROVES PLANTS

(*Continued from page 96*)

such duplex units are now available in capacities from 4 tons to 25 tons per hour. Practically all of the air furnaces of the new cupola-air furnace installations are of the ventilated bottom type which permit melting operations up to 16 hours per day without bottom failure.

The important benefits reported for continuous melting are: (1) greater production per molder; (2) less labor for other departments, since these departments are not called upon to supply labor for shifting molds during the heat; (3) cleaner and more pleasant foundry surroundings; (4) greater production per man-hour because mechanical handling is possible; and (5) higher quality of product because of more accurate control of operations when on a continuous melting basis.

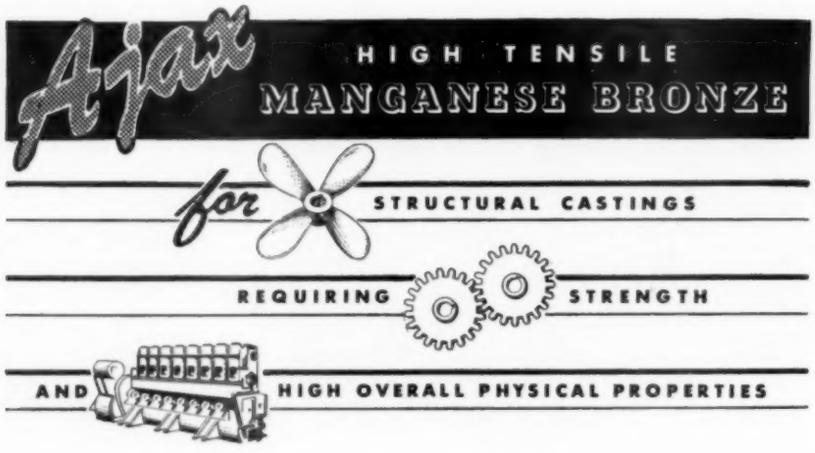
As a further aid to more efficient production and control, several foundries have installed equipment, such as shown in Fig. 12, for controlling the humidity of the blast in the cupola. The unit is so designed that the blast can be dehumidified in the summer and humidified in the winter, making it possible to operate the cupola with air of uniform moisture content throughout the year. Most installations operate in the neighborhood of 4 grains per cu ft. Before the installation of humidity control equipment, good metallurgical practice required determinations of humidity each hour and adjustment of the coke in the charge to provide the necessary control of carbon, manganese, and silicon in the iron. About 20 to 30 lb of coke must be added to each 10,000-lb metal charge to compensate for one grain of moisture change in the blast.

### Humidity Affects Structure

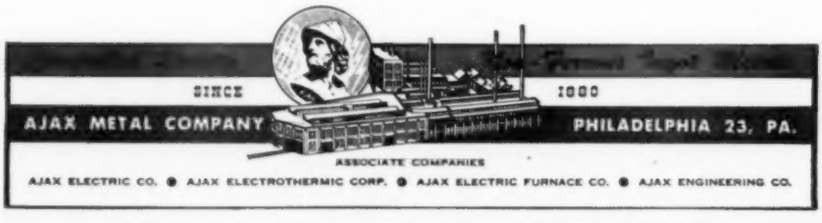
In addition to a detrimental effect on carbon control of the iron, variations in humidity were found to have a pronounced effect on the tendency of the iron to mottle. With conditions otherwise similar, iron made with blast of low humidity was found to mottle much more readily than iron made with blast of high humidity. Also the ability of the iron to anneal was affected markedly by moisture in the blast, high moisture contents producing iron that annealed with more difficulty than iron of the same composition made with blast that was low in moisture. The tendency for irons made with blast of high moisture content to shrink and crack was greater than it was for irons of the same composition made with blast of low humidity. In the malleable foundries in which controlled- humidity equipment was installed in order to achieve the desired metallurgical control, it was found desirable to maintain as low a moisture content in the blast as is economically practical.

Hot-blast cupolas are used sparingly in the malleable industry, but one plant reported that in changing from cold blast to hot blast at 300 F., the individual coke charges were cut approximately 150 lb per 10,000-lb metal charge, and the bed height was lowered to 4 to 6 in. in order to obtain the correct carbon content at the spout. More uniform analysis of the iron, the production of iron which annealed with greater ease, and a considerable reduction in the amount of trouble in cupola operation were claimed as some of the practical advanatages attributable to the hot-blast cupola.

Few major changes in molding practice followed the conversion of foundries from batch melting to continuous melting and mechanization. In one instance, however, a stationary sandslinger was provided for preparing molds for the larger


*Designers and foundrymen, charged with the gigantic responsibility of specifying engineering materials for the products of a world once again at peace, are closely scrutinizing the widest range of selectable materials ever offered to industry. Of primary importance is the direct consideration of Performance; and, decisions thus made must, of necessity today, be tempered with new emphasis on total Cost. An alloy, therefore, which measures high in strength, toughness and corrosion resistance—which has cut its eye-teeth long ago on marine castings and fittings, engine bases, pump bodies, gears, etc.—yet permits the foundryman to produce solid castings perfectly free from surface imperfections and which leave the sand bright and clean—and will take a mirror-like polish —an alloy like that deserves investigation. A metal of such calibre is Ajax High Tensile Manganese Bronze. Produced under rigid laboratory standards to constant formulae, this Ajax ingot has established recognition as the highest quality manganese bronze available. Write for complete data NOW.*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castings. The molding unit consisted of a turntable with 16 stations for 8 different castings. The arrangement permitted adequate flexibility in the choice of molds to be made, and was so designed that quick changes from one pattern to another at each station were possible.

Some progress was made in applying centrifuging methods to the casting of malleable iron, though the development is still in the initial stages.

The trend toward the use of synthetic sands was a natural consequence of the trend toward continuous melting and mechanization. In most mechanized foundries, the sand makeup comes from cores, the green strength being maintained by additions of bentonite, clay, or other forms of green bond. The permeability of such sands is high, but by control of the grain size of the core sand, the amount of fines in the circulating sand system, the moisture, the seacoal, and the green bond, the properties of the sand are held constant and the sand produces very satisfactory casting surfaces. Where costs of sands have been reported, marked savings have been indicated in changing from natural bonded molding sands and nonmechanized foundry practice to synthetic moldiing sands and mechanized foundry practice.

### Shorten Annealing Period

A large proportion of the annealing capacity for malleable still comes from the direct-fired periodic oven, although during war some additional continuous-annealing oven capacity was installed along with other types of batch ovens designed to shorten the annealing time. A major development in malleable annealing furnaces was the portable batch type radiant-tube oven with atmostpheric control, described earlier in the paper. With castings of sufficient size and weight, this oven requires no trays, boxes, conveyors, or packing material, since the castings need only to be stacked on the hearth and need not be packed in boxes to prevent surface scaling. A reduction of several days over the time for the usual commercial annealing cycle has been obtained in a foundry where ovens of this type were installed.

The use of the elevator car type electric oven was extended in both small and large foundries. This type of oven provides great flexibility in annealing equipment, and by using the two-chamber furnace arrangement described earlier, the economies of operation are said to approach those of the continuous type of furnace.

Car type periodic pot ovens were used more widely during the war period in an endeavor to speed the annealing cycle. Such ovens permit removal of the pots at 1200 F., and by rapid unloading and reloading of the car, it is possible for a new charge to be stacked in the hot oven in time to utilize the heat which is still retained. Annealing cycles range from 3 to 5 days for such ovens, showing that a substantial reduction in the overall annealing time is possible with their use.

A number of foundries converted their ovens to direct-fired pulverized coal, using either an individual direct-firing system or a circulating system for handling the fuel. Cost comparisons proved that pulverized coal firing is economical and satisfactory. This method of firing provided greater flexibility and more dependable control of the anealing cycle than hand firing.

One important feature being sought in modern annealing installations is to eliminate, wherever possible, the need for heavy cast pots and packing materials which resist heat penetration and are responsible for a temperature lag of many hours between oven and castings, the lag depending to some extent on the heating rate of the oven. When cast pots and packing material can be eliminated, the principal advantages are that


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the annealing times are shortened, the weight of the material to be heated is reduced, the cost of pots and packing is eliminated, and the labor required for loading and unloading the ovens is greatly reduced. An important consideration from the war standpoint was that the shortened annealing time increased the output of the oven and lessened the time lag between molding and shipping.

Sheet alloy boxes made from heat-resistant alloys and designed to make substantial reductions in the weight of annealing containers were a recent development in the malleable industry. In one installation, the sheet alloy boxes doubled the output of the annealing ovens.

A significant part of the war program was played by pearlitic malleable iron. The various government agencies recognized the possibilities of pearlitic malleable iron with its increased strength and wear resistance, and converted a number of critical parts to this material. It was used, for example, in the tank track roller because it provided greater life than an earlier design made from steel. Many thousands of tons of pearlitic malleable have found their way into a host of applications ranging from parts for heavy weapons to tiny castings for use in the small arms field. As a result of the adoption of this material for military castings, Ordnance pioneered and developed new specifications covering three grades of pearlitic malleable. Because of its high strength and modulus of elasticity, the use of pearlitic malleable to replace aluminum in automotive pistons was practical, and proved to be one of the early military developments in the malleable industry. These pistons, intermediate in weight between the aluminum pistons and cast-iron pistons, were highly successful in service.

The important developments in the malleable industry during the war were principally related to production practices and to the adoption of malleable iron to war applications where strength, toughness, and decidedly superior casting and machining qualities made it a particularly desirable engineering material. Metallurgical developments within the industry on the other hand were few, being virtually confined to additions of minute quantities of boron and tellurium for better control of annealing practice.

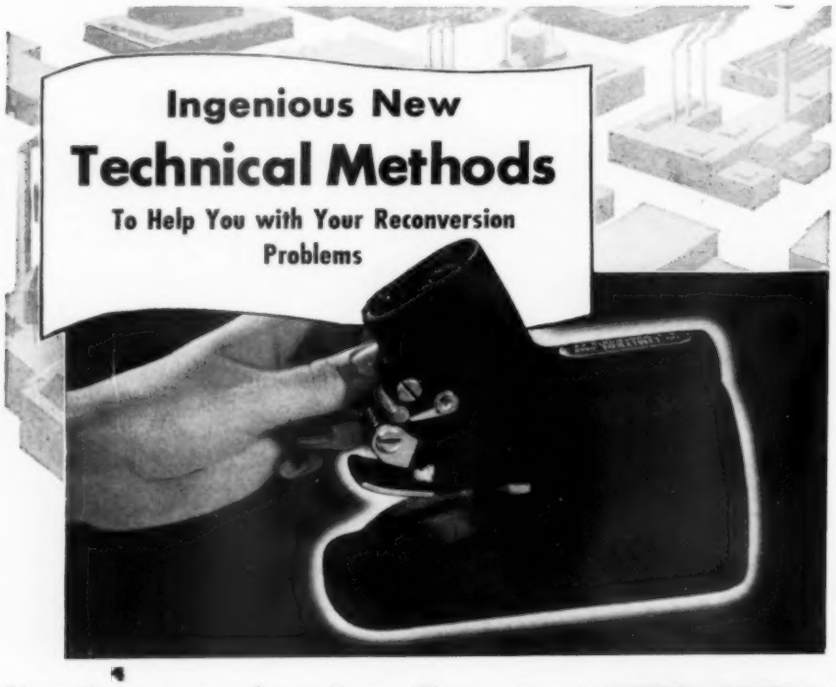
### Increase Malleable Production

From 0.001 to 0.003 per cent boron was used effectively for accelerating the anneal, and hence for increasing malleable production. Boron was particularly useful during the scrap shortage where stray alloys introduced with the scrap tends to increase annealing difficulties. When the scrap situation was unfavorable, boron proved effective as an insurance against annealing difficulties arising from various unforeseen causes, although its effect in shortening the annealing time was also utilized.

Experience showed that it was almost impossible to add boron to hand ladles and obtain consistent results. Iron poured from shank ladles was, therefore, treated with boron in the air furnace about 1/2-hour before tapping. With continuous melting practice, weighed increments of the boron-containing alloy were added successfully at regular and frequent intervals to the stream leaving the cupola. In foundries using bull ladles of greater than 100-lb capacity, boron was added directly to the ladle.

Refinement of the temper-carbon nodules in malleable accompanied the boron treatment, and such refinement is important from the standpoint of reducing the time for both stages of annealing. The general practice was to add 0.001 per cent boron, but when the iron carried other alloys of a character which retard annealing excessively, a somewhat larger addition was necessary. For irons

(*Concluded on page 218*)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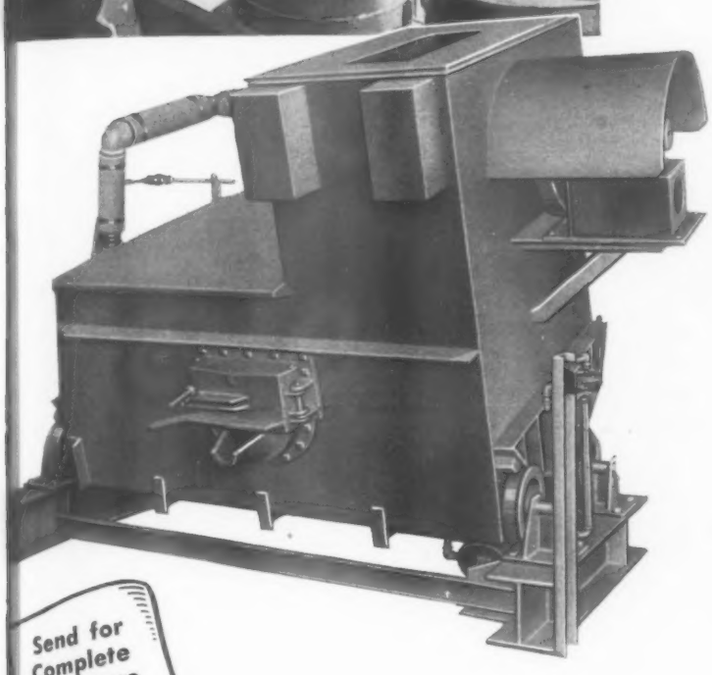

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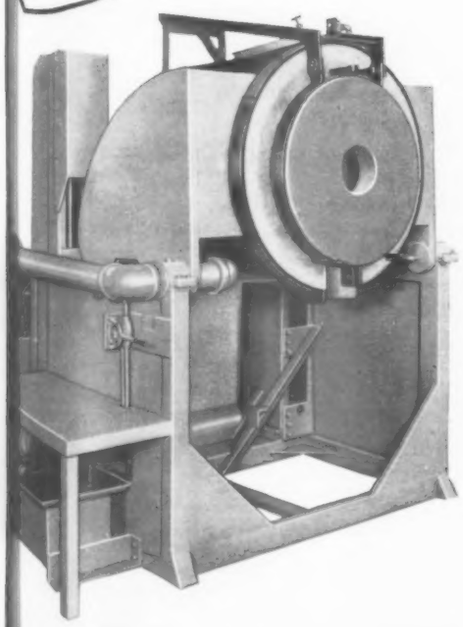

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(*Concluded from page* 216)

containing as much as 0.1 per cent chromium, boron avoided the annealing difficulties usually associated with small quantities of chromium. Boron additions were varied to suit the melting practice, but excesses were avoided since their effects were manifested by abnormally fine subdivision of the temper-carbon nodules near the casting surface, which lead to reductions in the physical properties of the iron.

The extreme potency of tellurium in stabilizing white iron was used to advantage during the war in the manufacture of certain pearlitic and regular malleable iron parts. In light castings, the use of tellurium in amounts of 0.003 to 0.005 per cent permitted the addition of enough silicon to make a substantial reduction in the time required for annealing. Additions of tellurium also permitted the casting of heavy sections with silicon contents normally considered to be excessive. By adding the right amount of tellurium, mottling in heavy sections was prevented, and the silicon content was allowed to increase without risk from mottling, so as to overcome the deleterious effects of tellurium on the annealing time of castings in the oven.

From this summary of accomplishments, it is obvious that the malleable industry during the war did a good job under very difficult conditions. Its improved position in the casting field, resulting from modernization and new developments, is certain to reflect a vigorous growth and continued progress for the industry during the postwar period when peacetime competition again prevails.

**Sources of Illustrations**

Fig. 1—Albert Kahn Associated Architects & Engineers Inc., Detroit.
Fig. 2—Centrifugal Casting Machine Co., Tulsa, Okla.
Figs. 3, 9, 11, 13, 15, 16—Whiting Corp., Harvey, Ill.
Fig. 4—Lake City Malleable Co., Cleveland.
Figs. 5, 6, 7, 8—Link-Belt Co., Chicago.
Fig. 10—Chain Belt Co., Milwaukee.
Figs. 12, 14—Surface Combustion Corp., Toledo, O.


# 101

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## Brass, Bronze Plants Make Advances

(*Concludcd from page* 103)

more rapid and a cheaper method of melting bronze than is possible in any other type of furnace. During the melting operation, care must be taken to avoid overheating, to avoid excessive loss of zinc and lead. The amounts of the different metals that will be lost during the melting process can be determined by trial, and compensated either in the ladle or in the cupola charge. Glass can be used for a slag covering over the metal in the cupola hearth to prevent excessive oxidation. The melting rate, which is controlled principally by the blast rate, should be slow in comparison with that for iron cupola practice, and the temperature must be kept below 2400 F.

To summarize, the principal wartime developments in brass and bronze casting have included: (1) the extensive use of manganese bronze because of its properties, its contribution to conservation of copper and tin, and its ability to utilize available scrap; (2) the "down grading" of tin bronze to aid in tin and copper conservation; (3) expansion in the fields of centrifugal and precision castings; (4) modernization of foundries, and (5) the development of the cupola melting practice for bronze.

**Sources of Illustrations**

Fig. 1—Briggs Mfg. Co., Cleveland.
Figs. 2, 3—Koppers Co., American Hammered Piston Ring Division, Baltimore.
Fig. 4—U. S. Naval Gun Factory, Washington.
Figs. 5, 6, 10—Ampco Metal Inc., Milwaukee.
Figs. 7, 8, 9—American Manganese Bronze Co., Philadelphia.
Figs. 11, 12—Cramp Brass & Iron Foundries Division, Baldwin Locomotive Works, Eddystone, Pa.

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# STEEL CASTINGS FIND NEW APPLICATIONS

(*Continued from page* 81)

New attention was given to sand and sand conditioning, and much new equipment for sand testing was acquired. Special apparatus for testing sand at elevated temperatures was developed and put to use.

An outstanding advance was made in the use of centrifugal force to aid in the shaping and feeding of castings. In one version, the technique of the centrifugally cast pipe was used to make numerous true centrifugal castings. These were usually some form of symmetrical hollow cylinder cast without a core, the most famous of which was the cast cylinder sleeve for aircraft engines. Such castings were made in both sand and metal molds with the latter apparently more popular.

Other castings were made by centrifuging or using a centrifugal force greater than the pull of gravity to insure good filling and feeding. In this technique, the mold cavities were usually placed symmetrically around a central vertical gate and the whole mold spun horizontally. This led to extensive use of the so-called stack molding, as shown in Fig. 12 and 14, in which numerous circular core segments are stacked vertically to make a mold. When such symmetrical articles as wheels and sprockets ars cast, the central down-gate may go right through the hubs. In other cases, a large number of small castings, often of great diversity in shape, are closely nested around the down-gate. Stack molding is not new and has been and is still used for static castings, notably the cast crankshaft, but it was found to be even more adaptable to economical mass production by centrifuging.

Precision casting also found new fields of usefulness. This is the method in which the dental technicians' system of making cast inlays and the ancient art of lost-wax molding are combined to produce castings so close to desired size and finish that little or no machining is required. The mold is constructed of a fairly fluid mix which requires no ramming but which sets up to hard concrete-like texture. Patterns are made of wax or synthetic plastics which are melted or vaporized out by heating the whole mold. Although some static castings were made by this method, the necessity for quickly filling the mold favored centrifuging.

**Heat Treatment**—Probably the most significant changes took place in the heat treatment of castings, and this affected both methods and equipment. Because so much of the production was for ordnance, where the highest properties obtainable are demanded and where strength-weight ratio is so important, water quenching of castings took a prominent place. Although this heat treatment for castings is old in the art, it was formerly confined to small castings and to small lots. Now, for the first time, foundries were water quenching a large part of the current production.

Not only were small castings so treated, but water quenching of parts weighing thousands of pounds became commonplace. This experience and the results obtained completely refuted the long-held prejudice that steel castings were not rugged enough to stand water quenching. Steels were made to specified hardenabilities, and it was found that there was no important difference between cast and wrought steel in regard to S-curves, hardenabilities, or hardenability calculations. In other words, cast steel is not a different material but is a different way of making a steel product.

Martempering or the process of quench-

(*Continued on page* 222)


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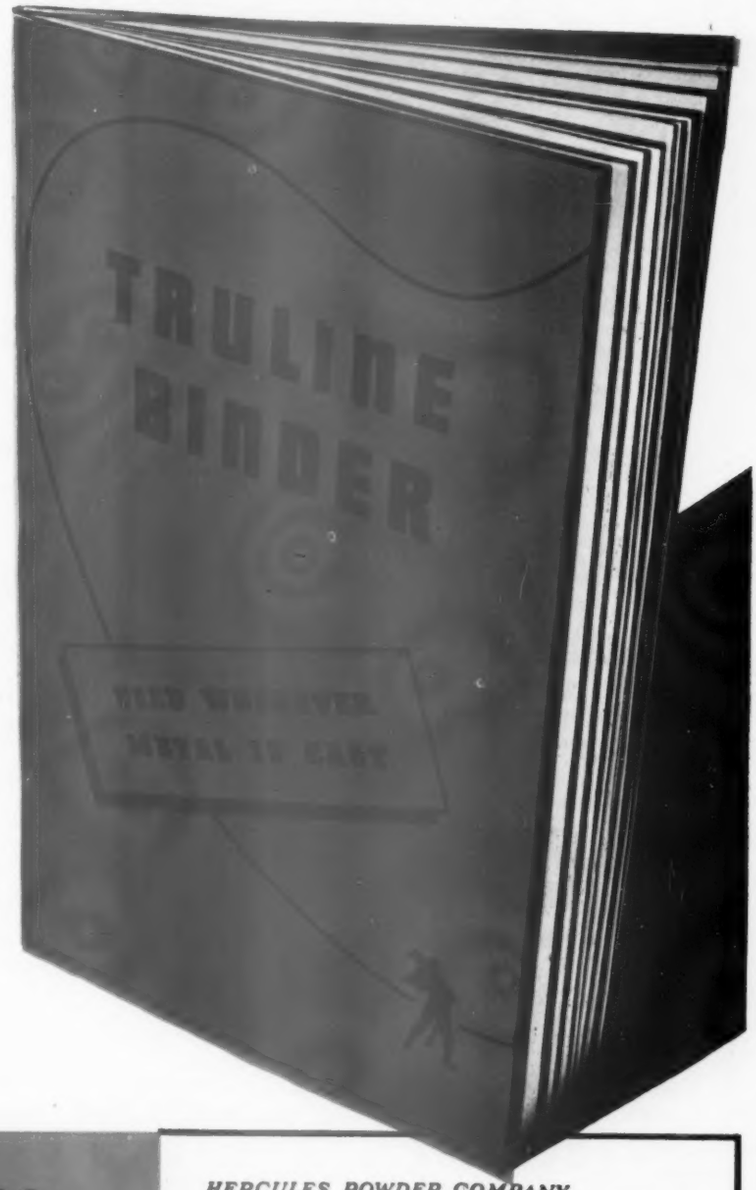


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(*Continued from page* 220)

ing to a temperature below the upper nose of the S-curve but above that for martensite formation has been successfully applied to castings, although considerable difficulty has been encountered in attempts to use this principle on heavy sections.

An important outcome of this trend in heat treatment has been the acquisition by many foundries of excellent heat treating facilities, an item in which most foundries had previously been notably deficient. Such heat treating installations are usually thoroughly mechanized for expeditious handling of the charges. In jobbing foundries, the batch type of furnace was preferred, whereas the continuous or tunnel type was favored when large numbers of similar castings were to be treated. Special fork attachments to cranes allowed whole trays of castings to be removed from batch furnaces and quenched en masse. Continuous furnaces are usually arranged in parallel pairs with one used to heat for quenching and the other, with reversed flow, for drawing or tempering.

Because of this available equipment and because of the experience gained during the war, it seems certain that water quenching will play a prominent part in the future heat treatment of castings.

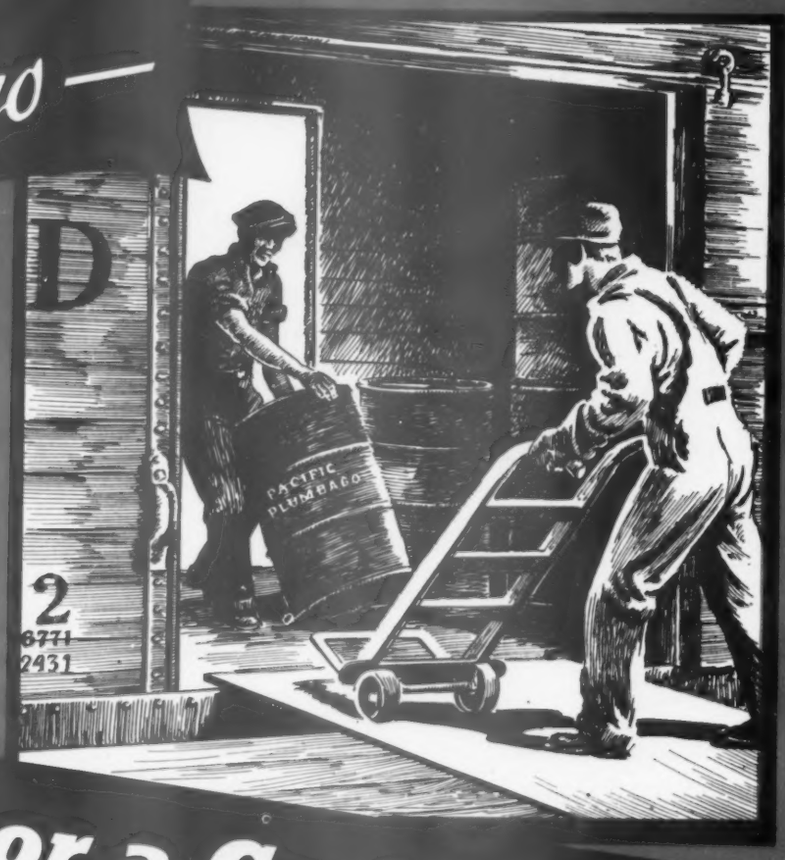
**Testing and Inspection**—In wartime, when a nation is literally fighting for its life, nothing but the absolute best in equipment for its fighting forces will do. Economics and expediency are ruthlessly pushed into the background to favor quality. In common with other products, steel castings were made to more rigid requirements than ever before, and this factor demanded more searching methods of testing and inspection.

Although both x-ray and magnetic powder methods of inspection were well known before the war, their widespread adoption to steel casting inspection was distinctly a wartime development. The million volt x-ray tube was a timely development and was put promptly into use. Gamma-ray inspection with radium capsules was used for many heavy section castings when high voltage x-ray equipment was not available.

The magnaflux method of magnetic powder inspection for cracks, tears, large foreign inclusions, blowholes, or other flaws that are at or close to the surface, was adapted to steel castings of various sizes and shapes by a number of devices. Among these are the contact method whereby the casting is magnetized by flowing current through it in various directions, depending on the points of contact, and the induced method in which the casting is placed within the loop of

(*Continued on page* 224)

# PACIFIC Plumbago—



# a Drum or a Carload!

PACIFIC PLUMBAGO is available to the foundries of the nation in a wide range of grades for use with either green or dry sand, for aluminum, iron or brass castings from the smallest to the largest.

Pacific Plumbagos may be sprayed on, brushed, slicked, or dusted, but there is a particular grade which produces the maximum results on a given class of work. Tell us exactly what you are pouring and we will gladly make a recommendation.

Our factory production is geared to take care of your needs fully and quickly—no matter whether you require a single drum, ten drums or a carload. With a constant, uniform source of supply assured, it's good business to standardize on PACIFIC PLUMBAGO.

"Quality is Never an Accident . . . It is Always the Result of Intelligent Effort."

SALES TO FOUNDRIES BY FOUNDRYMEN

## PACIFIC GRAPHITE WORKS

40TH AND LINDEN STREETS · OAKLAND 8 · CALIFORNIA

deoxidizing
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General Purpose
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ERIE STEEL CONSTRUCTION CO.
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(*Continued from page 222*)

an insulated conductor.

Both of these nondestructive methods of examination were adopted primarily as inspection tools to test the suitability of castings for service and at first were regarded somewhat in the light of added burdens and necessary nuisances. It became quickly apparent, however, that they could also serve the invaluable purpose of aids to the development of sounder and better castings. This use supplemented the older method of sectioning to locate shrinkage cavities and other flaws and became an important factor in the enhancement of quality in steel castings.

The Jominy hardenability test was also a prewar development but during the war became a useful tool for the steel foundry metallurgist.

**Specifications**—Although most of the specifications written were labeled "emergency," it is interesting to note the trend, one which will probably continue. The tendency is to specify the properties and requirements of the product and leave it up to the producer to get them any way he can. For example, in recently proposed specifications for steel castings, there is no restriction on the way the steel is to be made and about the only mention of composition is a ceiling on phosphorus and sulphur. This gives the producer more latitude to utilize his experience and judgment but, at the same time, imposes a greater responsibility on him.

**Products**—The list of products developed as steel castings during the war is a long and imposing one, and only a few representative ones can be mentioned. One of the first to get into production, as well as one of the most important, was tank armor. Without cast armor, the vast tank building program would not have been possible. Cast armor had the advantage over rolled and welded construction of being adaptable to streamlining, and changed the tank from a flat-sided and angular construction to one of curves and domes. Such construction is less vulnerable, because it presents less surface for frontal attack. The improved appearance was of secondary importance. Cast tank armor stood up under severe punishment, and turrets up to 6-in. wall thickness were in production before the war ended. Other tank parts, such as sprockets and treads, were made in quantity.

One of the most successful ordnance castings developed during the war is the cast steel breech ring. Introduced at a time when the country was desperately short of forging capacity and machine tools to finish the forgings, they quickly proved their worth and were soon in mass production. Not only did they re-

lieve the forging situation, but they could be cast so much closer to finished dimensions than by forging that tremendous savings in machining operations were realized. These breech rings were made in lightweight sizes for airplane-mounted 75 mm guns and pack howitzers and up to 3000-lb castings for 5-in. naval rifles, but there is no record of failure in service. Gun mounts, motor shells, and bomb parts are included in the list of successful castings made for ordnance use.

Centrifugally cast aircraft engine cylinder sleeves weathered much adverse criticism and proved that they were at least the equal of forged sleeves in quality and, in some opinion, had better properties. Centrifugally cast artillery gun barrels, though high in favor by the arsenals, never got into mass production for the smaller sizes, because they could be made so fast by the seamless tube piercing method.

One of the most interesting and difficult developments was the cast rotors and stators for superchargers. These extremely intricate castings were made by the centrifugal, precision-casting method and usually high heat-resisting steel alloys. Once the details of technique were worked out, not only were many man-hours of labor saved over the tedious assembly by welding of small parts, but the assemblies were more efficient, because the vanes could be made to airfoil shape.

**Sources of Illustrations**

Fig. 1—Pelton Steel Casting Co., Milwaukee.
Figs. 2, 7, 9—Ohio Steel Foundry Co., Lima, O.
Fig. 3—Whiting Corp., Harvey, Ill.
Fig. 5—Allis-Chalmers Mfg. Co., Milwaukee.
Fig. 6—American Steel Foundries, Chicago.
Fig. 10—Campbell, Wyant & Cannon Foundry Co., Muskegon, Mich.
Fig. 11—Watervliet Arsenal, Watervliet, N. Y.
Figs. 12, 14—Centrifugal Casting Machine Co., Tulsa, Okla.
Fig. 13.—Official photograph, U. S. Navy.
Fig. 15—Youngstown Alloy Casting Corp., Youngstown.

## Consolidates Plant Facilities

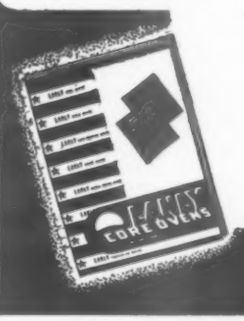
W. S. Rockwell Co. has consolidated activities of the Rockwell Furnace Division, the Rockwell Valve Division and the Gehnrich Oven Division to provide enlarged engineering and plant facilities and services, with general headquarters at 200 Eliot St., Fairfield, Conn. Sales engineering office is retained at the old address, 50 Church St., New York 7.

---

L. W. Casting Co. is the firm name under which Luther Wallander has published a certificate that he is conducting a foundry business at 6046 Agra St., Bell. Calif.

LANLY
CORE AND MOLD OVENS

If interested in new equipment or remodeling of ovens for core baking, mold drying or casting conditioning, write for this catalog.

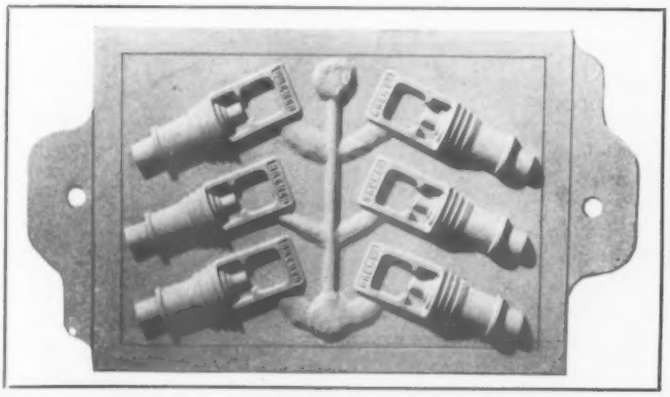



It illustrates a complete line of equipment, describes the features responsible for highly efficient and economical operations and contains a list of Lanly oven purchasers whose known high standards are an implied endorsement of Lanly Ovens.

THE LANLY COMPANY
750 Prospect Ave. CLEVELAND, OHIO

INCREASE PRODUCTION
IN '46 WITH
TAMASTONE
THE PERFECT PATTERN COMPOUND

Foundries everywhere are starting the New Year *RIGHT* with TAMASTONE—SAVES HOURS by converting loose and metal gated patterns into match plate production. Ideal for separate cope and drag patterns too!



At left is a complete Super TAMASTONE match plate made from 6 loose patterns. Loose pattern costs cut 50-75%.

PRODUCTION INCREASED 400%

TAMMS SILICA COMPANY, 228 N. LaSalle St., Chicago, Ill.

## Electric Furnace Steel Conference

(*Concluded from page* 154)

of Technology, Cambridge, Mass., in which he stated that he believed that fluidity was most important to steel foundrymen and measurement of that characteristic was extremely valuable in determining proper tapping time. He mentioned various measuring procedures for fluidity, but said he found the spiral test most useful.

Kenneth L. Clark, Naval Research Laboratory, Anacostia, Md., described application of the spiral fluidity test at the laboratory, and the results obtained. V. J. Howard, Oklahoma Steel Casting Co., Tulsa, Okla., discussed the value of standardized practice and setting up melting schedules to obtain proper fluidity and temperature. C. B. Williams, Massillon Steel Casting Co., Massillon, O., pointed out that investigation of fluidity tests indicates that temperature is an important variable. Other comments were that steel over-oxidized early in the heat or over-reduced during the finishing usually are low in fluidity. However, it was suggested that trouble with so-called over-reduced steel might be due to the heavy slag covering which does not permit heat penetration into the steel bath.

In a discussion of recovery of alloys, J. M. Clifford, Bison Castings Inc., Buffalo, said that it was about 75 per cent for manganese, as charged into the furnace, and 70 per cent for silicon. Iron oxide content of the slag affects recovery and should be low for best results. J. F. Robb, Climax Molybdenum Co., Pittsburgh, summarized replies obtained from a number of foundries on alloy recovery. For recovery of chromium from scrap, much depended upon the amount in the scrap, and where the amount was under 0.60 per cent the recovery ranged from 85 to 95 per cent; in the range from 0.60 to 0.90 per cent, recovery was 88 to 98 per cent, and in the range 0.90 to 1.00 per cent, recovery was 85 to 100 per cent. With manganese in the 0.70 to 1.00 per cent range recovery of that element was 65 to 85 per cent; in the 1.00 to 1.30 per cent range, recovery was 57 to 85 per cent while in the 1.30 to 1.60 per cent range, recovery was 52 to 76 per cent. For manganese added in the ladle, recovery was about 95 per cent while that for ferrosilicon was from 95 to 98 per cent.

C. L. Richards, Adirondack Foundry & Steel Inc., Watervliet, N. Y., mentioned that he found a recovery of chromium in scrap of about 60 per cent while that added as ferrochromium in the ladle showed a recovery of 90 per cent. Manganese in the range 0.70 to 1.00 per cent showed a recovery of 65 to 70 per cent, and recovery for silicon was from 72 to 75 per cent.

## OBITUARY

**JOHN H. LOCKE,** who retired in 1943 as vice president of General Steel Castings Corp., Eddystone, Pa., died Nov. 12 at his home in Bryn Mawr, Pa. A graduate of Massachusetts Institute of Technology, Mr. Locke joined the Commonwealth plant in 1912. When it was merged with the General Steel Castings Corp. in 1931, he became general manager and later was transferred to Eddystone, Pa., as general manager of operations, and subsequently became vice president.

° ° °

**George A. Damon,** 68, mining and mechanical engineer, died Nov. 23 in Stockton, Calif. Mr. Damon was associated with the Stockton Iron Works from 1935 until his retirement several months ago. He was previously employed by the Monarch Foundry & Engineering Corp., Stockton, for 17 years.

° ° °

**Frank C. Angle,** 45, manager of the general machinery division field sales offices, Allis-Chalmers Mfg. Co., Milwaukee, died Oct. 25. He joined the company in 1929 as a salesman in the Chicago office.

° ° °

**Rudolph A. Eidam,** 46, general foundry foreman, Indiana Harbor Works, American Steel Foundries, East Chicago, Ind., died Dec. 12 in Hammond, Ind. He had been associated with the company 28 years.

° ° °

**Joseph Michaels,** 73, chairman, Hyman-Michaels Co., Chicago, died Nov. 21 in Highland Park, Ill. Associated with the iron and steel scrap industry more than 50 years, he founded the company in 1911.

° ° °

**Maurice C. O'Brien,** 51, vice president, Material Service Corp., Chicago, died Nov. 28 in Evanston, Ill. He had been associated with the corporation 25 years 8 years as vice president.

° ° °

**Henry R. Hoffman,** 81, pioneer foundryman and stove manufacturer, who more than 50 years ago founded the Major Foundry Co., Chicago, died Dec. 3 in that city.

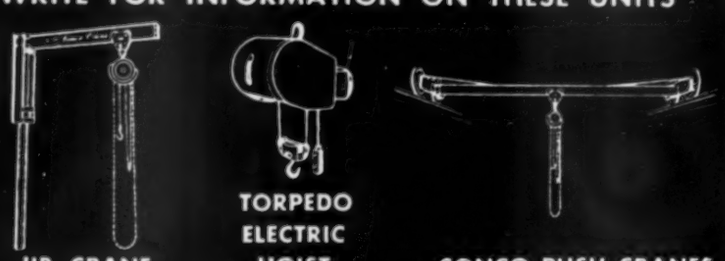
° ° °

**Edwin J. Mohr,** 62, former production manager, Symington-Gould Corp., Rochester, N. Y., died Oct. 21 in that city.


Conco FOUNDRY CRANES

**● CONCO type DM Overhead Electric Crane moves materials swiftly, economically on a foundry floor. Write us for information on various CONCO Cranes, Hoists and Trolleys recommended for, and proved in, *foundry installations.* Our long experience enables us to recommend the right equipment, in the right size, for the right job.**

WRITE FOR INFORMATION ON THESE UNITS




CONCO ENGINEERING WORKS Division of H. D. Conkey & Co. 53 Grove St. — MENDOTA, ILL.

## Meehanite Institute Holds Meeting

Possibilities of investment molding of high test iron were among the subjects stressed at the 20th annual meeting of the Meehanite Research Institute at the Hotel Astor, New York, Nov. 15-17. This process, had previously been employed in the molding of steel and nonferrous metals. However, research in meehanite indicates that the process can be successfully applied to high test iron. Also emphasized was the importance of stress analysis in iron castings design.

The meeting was featured by the presentation of 45 papers devoted to foundry engineering, metallurgy and sales, with about 175 representatives of meehanite foundries in the United States, Canada and abroad in attendance.

Speakers included O. Smalley, president of the institute and of the Meehanite Metal Corp., New Rochelle, N. Y.; E. M. Currie, International Meehanite Metal Co., London, England; C. R. Austin, assistant to the president, Meehanite Metal Corp.; H. B. Hanley, superintendent, American Laundry Machine Co., Rochester, N. Y.; A. C. Denison, president, Fulton Foundry & Machine Co., Cleveland; T. E. Eagan, metallurgist, Cooper-Bessemer Corp., Mt. Vernon, O.; and H. A. Reece, vice president, Mechanite Metal Corp.

Other speakers were C. E. Herington, Meehanite Research Institute of America Inc., New Rochelle, N. Y.; E. S. Clark, chief engineer, Meehanite Metal Corp.; C. F. Moore, foundry superintendent, Cooper-Bessemer Corp., Grove City., Pa.; C. F. Walton, metallurgist, Meehanite Metal Corp.; W. H. Moore, metallurgist, Meehanite Metal Corp.; W. W. Kerlin, foundry engineer also of Meehanite Metal Corp., Don Webster, metallurgist, American Laundry Machine Corp.; George Johnstone, foundry superintendent, Cooper-Bessemer Corp., Mt. Vernon, O.; and C. A. Hartman, metallurgist, Meehanite Metal Corp.

E. A. Piper, sales manager, Pohlman Foundry Co., Buffalo; H. W. Kelly, design engineer, Meehanite Metal Corp.; W. W. Harmon, foundry manager, Kanawha Mfg. Co., Charleston, W. Va.; and W. M. Murray, professor of metallurgy, Massachusetts Institute of Technology, Cambridge, Mass.

## Ceramists To Meet

Annual meeting of the American Ceramic Society Inc., will be held in Buffalo, April 28 to May 1, 1946, inclusive, according to a recent announcement. Headquarters will be at the Statler Hotel.


Centrifugal Casting News

Vol. 2 — CENTRI-MECO of KALAMAZOO — Jan., '46

**Worth Repeating...**

**MASTER Challenges them all . . .**

for heavier or off-balance loads! New Master CENTRI-MECO with "Miracle-Hub" heat free bearings and massive construction (nearly two tons) provides fast acceleration, balanced spinning power, safe trouble-free operation over long sustained production periods. Sand or permanent molds may be stacked to any workable height. 24" diameter spinning-head, seen above floor level in illustration, takes up to 60" adapter-plate.

* * *

One of the big advantages of the centrifugal method of casting, from the production angle, is that large quantities of metal may be poured at one place and at one time . . . metal fills the stacked-mold cavities with a minimum of gates and sprue. Send your parts blueprints for engineering reports without obligation.

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CENTRIFUGAL MACHINE & ENGINEERING CO.
633 JACKSON CT., KALAMAZOO 7, MICHIGAN

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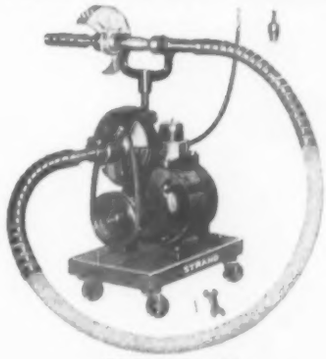
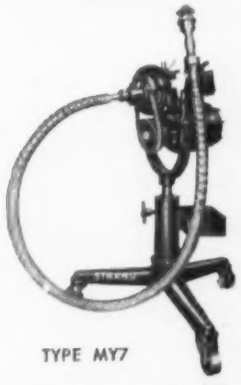
FLEXIBLE SHAFT MACHINES

ALL TYPES AND SIZES—1/8 TO 3 H.P.

STURDY WELL DESIGNED AND EFFICIENT MACHINES FOR THE FOUNDRY PATTERN SHOP AND MACHINE SHOP



TYPE M6—½ H.P.



TYPE MY7

HAND CUT HIGH SPEED STEEL ROTARY FILES AND GROUND CUTTERS

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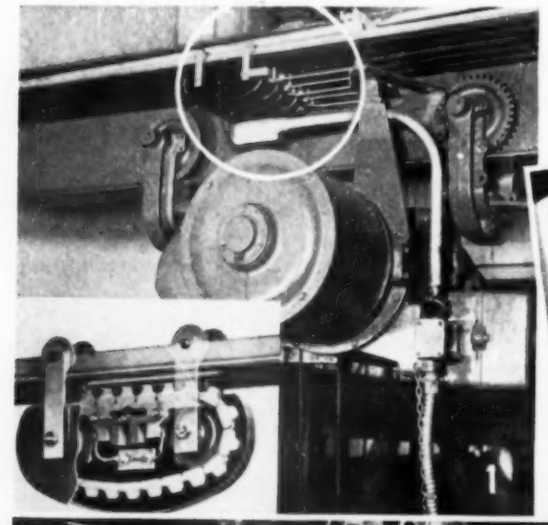
# NEW EQUIPMENT and SUPPLIES

**(1)—Insulated Trolley:** Benbow Mfg. Co., Hobart Bldg., San Francisco 4, Calif., has developed a rubber insulated trolley suitable for virtually every type of electrically-operated mobile equipment such as cranes, monorails, portable tools, etc. It is said to meet safety code requirements prohibiting unguarded conductors and to be economical to install in old or new plants. It consists of a copper conductor in standard 10-ft lengths encased in a slotted rubber rack supported by a rigid backing; and individual traveling collectors which employ an endless chain, like a tractor tread, to effect positive six tooth multiple contact at all times.

**(2)—Legging:** American Optical Co., Southbridge, Mass., announces a new legging specifically designed to accomplish three major objectives—complete leg protection for foundry and other industrial workers, easy adjustment, and quick release. The legging protects front, back and sides of leg, from instep to knee. It is available in chrome leather, specially tanned to resist heat and hot metal splashes, and may also be obtained in asbestos or fire-resisting duck. All leggings have a chrome leather flare over the instep. A newly-designed spat, identical in construction with the new legging, except for its shorter length, also is available.

**(3)—Dump Box:** Mercury Mfg. Co., 4036 South Halsted St., Chicago 9, Ill., has devised an attachment for its hydraulic fork trucks which makes it possible to dump automatically the contents of a box skid while the load is in a raised position. Box skids used have a special hinged bottom. Loops welded to the box are engaged by hooks on top of movable uprights of the truck and cause the bottom to fall away when the forks are lowered. Attachments welded to uprights of the truck enable the operator to trip the load at predetermined heights.

**(4)—Centrifugal Casting:** Centrifugal Machine & Engineering Co., 659 Jackson Court, Kalamazoo 7, Mich., announces its new Master model centrifugal casting machine. It is shown here in a pit ready for operation, but without protective hoods and spill pans. It is designed for heavy off-balance load, and its large mass—net weight 3700 lb—permits the standard 24-in. spinning head to be extended up to 60-in. diameter by installing an adapter plate. Molds may be stacked to any workable height. Four strut-vanes on the mounting-plate act as a fan to remove excess heat radiated above the top bearing and thereby promote continuous operation. Motor of standard model is in ratio of 1 to 1 but by changing the drive sheave almost any desired speed may be obtained from 400 rpm to motor speed. Several types of variable speed controls, at additional cost, from 218 to 1750 rpm make it possible to deliver constant torque continuously.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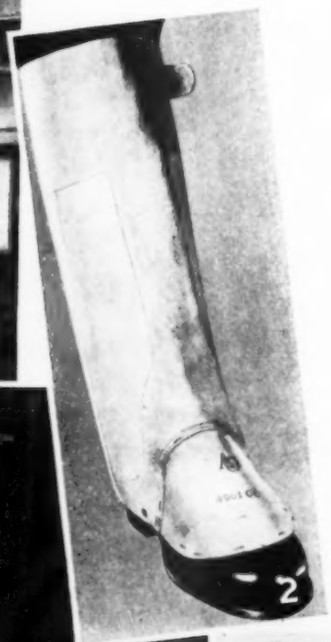
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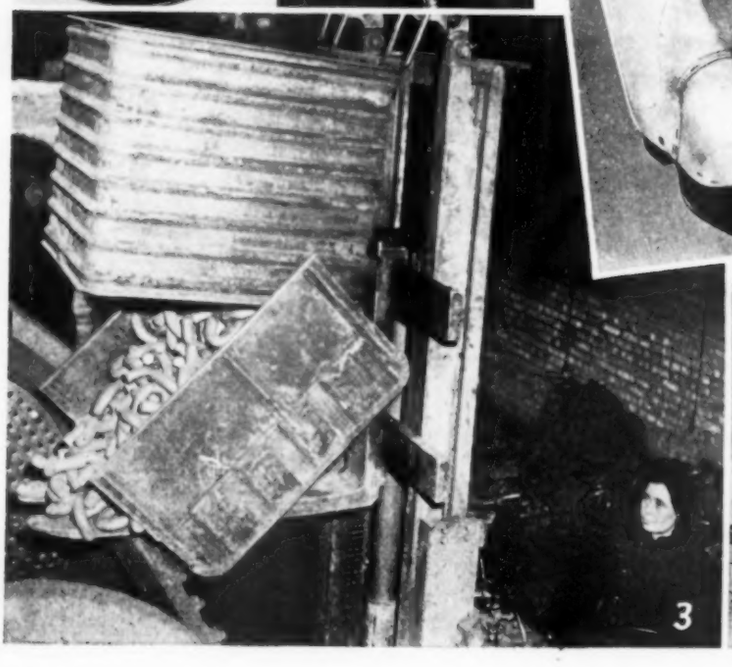
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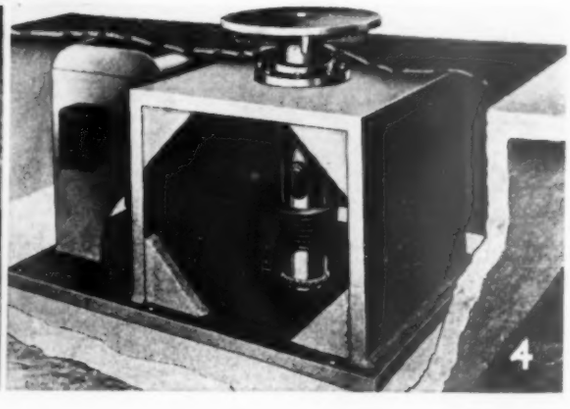
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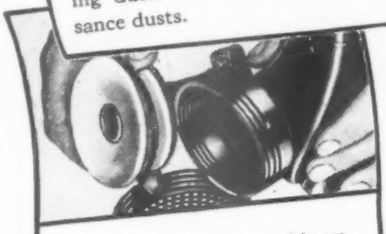
## This One Respirator does the job of Four

Yes, workers get 4-way safety with this Willson respirator. Protects lungs against 4 different industrial hazards. Metal fumes. Pneumoconiosis-producing dusts. Toxic dusts. Nuisance dusts.



Two double filters provide extra-large filtering area. Give workers the greater comfort of free-and-easy breathing. Filters are throw-away type. May be easily, inexpensively replaced.

Face piece available in two sizes to fit either small or large face. Both sizes carry Bureau of Mines approval. Compact, the respirator may readily be worn under a welding helmet.

*For help on your lung-protection problems, get in touch with your Willson Distributor or write direct to Dept. F-1.*

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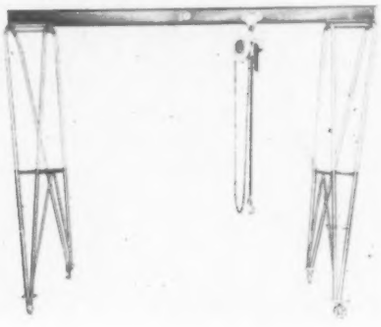
PRODUCTS INCORPORATED

READING, PA., U. S. A. Established 1870


**Pyrometer:** A new portable pyrometer, with a direct reading scale, has been designed by Roller-Smith Co., Bethlehem, Pa., for use in the metalworking industry in measuring furnace temperatures, temperature of molten metals, chemical baths, lead and zinc pots and other applications where temperature readings are needed in the 1200 F

range. The new instrument is so constructed that no parts will work loose in service and is built to withstand normal strains of jars, vibrations, and other conditions incident to shipping, storage and service. Parts are interchangeable to prolong life and facilitate repair. Inserted into liquid or atmosphere to be measured, the temperature is read direct from the scale.

**Load Handler:** Shaw - Box Crane & Hoist Divisions, Manning, Maxwell & Moore Inc., Muskegon, Mich., have just placed on the market a mobile load handling unit of 2000 lb capacity, available as a complete unit, as shown in illustration, or as an assembly which includes all parts to build the frame



except the 1-beam which may be obtained locally. The frame legs are formed from steel pipe welded into rigid one-piece units, mounted on heavy duty industrial casters equipped with anti-friction bearings and ball bearing thrusts to insure easy movement and free swiveling. Complete assembly weighs 270 lb, and entire space between the legs may be served because the inside faces of them are vertical to their entire height. Dimensions of frame with 1-beam mounted are: Over-all height 10 ft.; clear space beneath 1-beam 9 ft. 6 in.; clear space the entire height between inside the legs 9 ft. 4⅜ in.; width at floor 5 ft. 4 in.; length overall 12 ft. 6 in. Frame is designed so that a chain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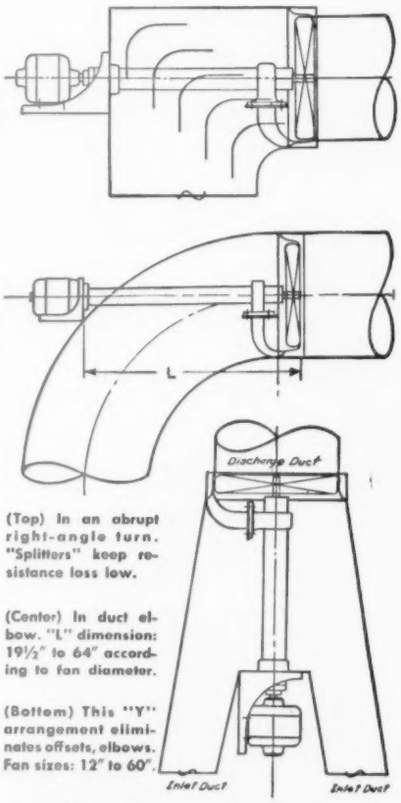
**Extended-Shaft Fans Make Tough Jobs QUICK, EASY!**

*Propellers Have 2 to 12 Blades*

For those many air-moving jobs where motors must not, or should not, operate *within* the air stream, Propellair extended-shaft *airfoil* fans offer quick and easy solutions to otherwise difficult problems. They are compact, trouble-free, easy to install, remarkably *efficient.*




(Top) In an abrupt right-angle turn, "Splitters" keep resistance loss low.

(Center) In duct elbow, "L" dimension: 19½" to 64" according to fan diameter.

(Bottom) This "Y" arrangement eliminates offsets, elbows. Fan sizes: 12" to 60".

Get *all* the facts on these and other Propellair fans for industrial ventilation. Types and sizes for every service, all with modern *airfoil* blades. Ask us, today, for Catalog No. 10-F.

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block or electric hoist suspended from an I-beam trolley may be employed as hoisting unit.

**Container:** Kindt - Collins Co., 12651 Elmwood Ave., Cleveland 11, O., announces a handy new container of heavy aluminum, built to satisfy a wide range of shop uses. A crossbar support inside the can, removable for cleaning, serves as a wiping bar for surplus material on the brush and as a unit upon

which to hang the brush when it is not in use. Cone-shaped top fits snugly over the can, covering brush and contents, to prevent hardening and evaporation. Aluminum will not stain or discolor contents of the can. The container is available in 1 and 2-quart sizes for varying needs requiring glues, coatings, etc.

**Vertical Motor:** Crocker-Wheeler Division, Joshua Hendy Iron Works, Ampere, N. J., announces a new addition to the company's line of protected type ac motors. A vertical drip proof motor rated at 40 C rise continuous duty with a 15 per cent service factor, is de-

signed for operation from 60 or 50 cycle, 3 or 2 phase circuits at all standard voltages. Ventilating openings are shielded against dripping of liquid or solid particles. Oversize ball bearings are provided to carry thrust in addition to the rotor. The company's patented centrifugal bearing seal permits the use of softer grease. Other features include a new, recessed junction box; rotor, bars, fans and end rings made of a single aluminum alloy casting; heavy cast frame construction and coils protected with vinylastic insulation.

**Hand Hones:** Bay State Abrasive Products Co., Westboro, Mass., announces two new pocket-size, vitrified diamond hand hones for sharpening carbide tools. Both models are available with a diamond section 7/16 in. wide by 1 in. and 1½ in. long with $\frac{1}{16}$ in. depth of diamonds. Both styles are supplied with plastic handles and each is furnished in a handy leather pocket case. One model has a hone at both ends, the other, a hone at one end.

**Casters:** Faultless Caster Corp., Evansville 7, Ind., has available a new swivel plate caster for extra heavy duty, said to roll and swivel easily under loads up to 9 tons per caster. It provides a new method of moving heavy production equipment, stock and other loads. Precisely engineered and finished to machine tool tolerances it is available either with flat tread on open floor surfaces, or with V-grooved wheel on angle iron track.

**Controller:** A new electric type controller which combines a proportional current input controller and a recorder in one case has been developed by the Bristol Co., Waterbury 91, Conn. Designed to provide extremely accurate control of electrically heated furnaces and ovens, this new instrument provides on-and-off type control with the advantages of proportioning control. Rotating cam interrupts the flow of current to the heating coil or coils, the duration of which is determined by the departure of the controlled temperature from the control point.

**Bag-Holding Truck:** Chicago Mfg. & Distributing Co., 1928 West 46th St., Chicago, Ill., has improved the design of its bag-holding truck. The truck will accommodate any size bag which is attached to the spreader band without adjustment, the height of the latter being quickly set at any position from 18 to 40 in. high. Five strong malleable iron cam locks hold bag in position, the more weight being held in bag, the tighter the grip. Base is made of malleable iron casting, mounted on 6 or 8 in. diameter wheels. Special sizes of spreader bands and stationary bases can be supplied on order.

**Metal Spray Gun:** Metallizing Co. of America, 1330 West Congress St., Chicago 7, Ill., announces development of a new gun said to effect new economies in metal spraying operations through increased efficiency and higher spraying speeds. It is lighter, better balanced and smoother operating than previous models. The exhaust opening is screened to exclude dirt from the tur-

bine housing when the gun is not in operation. Use of a minimum number of parts permits the gun to be assembled or disassembled without special tools. Use of an improved turbine is said to make the gun capable of spraying up to 14 lb of steel, 40 lb of zinc or 120 lb of lead per hour. Any combustible gas can be used and air pressure is only 50 psi.

**Hand Truck:** Northrop Gaines Inc., 1985 E. Sixteen St., Los Angeles, Calif., has developed three sizes of hand trucks having frames cast in one piece of aluminum. The smallest of the three

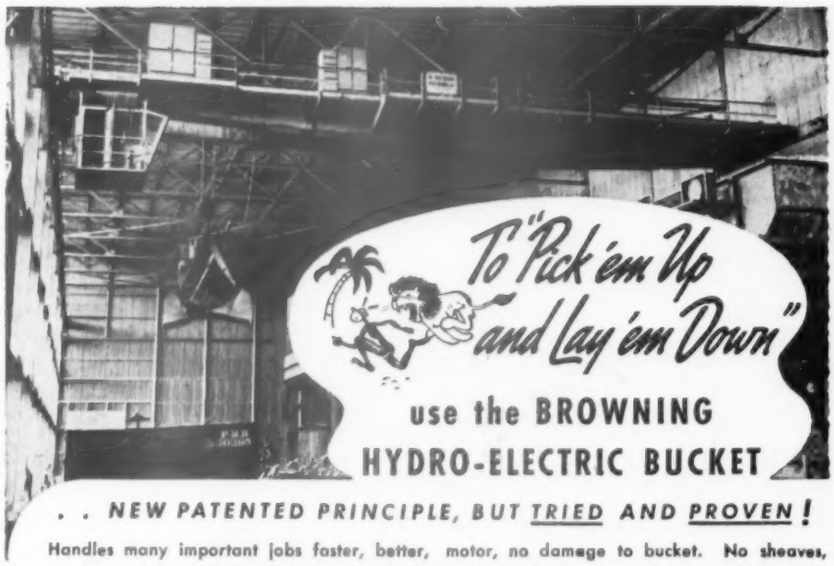
sizes weighs only 36 lb but has been stress-tested under a 5000-lb load. Truck wheels are cast aluminum with hard rubber tires molded in place by a new process.

**Humidity Control:** Surface Combustion, Toledo, O., announces a new package unit of its Kathabar humidity control system. It is available in sizes for 1350, 2500, 3500 and 5000 cfm. Like the large central system manufactured for a number of years, the package unit utilizes a chemical absorption medium for controlling moisture content of the atmosphere. The solution adds to, or removes moisture, in accordance with the desired, single control setting. Solution temperature is maintained by modulating the water to the contactor-cooler. This operation is automatic.

**Blow Valve:** Flex-Rite Valve & Mfg. Co., 118 South Cheyenne, Tulsa 3, Okla., offers a compressed air blow valve, designed to assure positive control of the air flow. Angle of the nozzle and easy flexing control lever together with flexibility of the unit make it simple to direct the compressed air stream to the exact spot where air is needed. Rubber valve washer, the only part necessitating replacement, is operated by the control lever, and seats firmly in the valve seat to prevent leaking of air when blow valve is not in use. The washer can be replaced in a few minutes at a cost of only a few cents.

*Only part to replace is Rubber Valve Washer "O"*

**Brake Control:** A new brake control unit which provides automatic cushioned emergency stops when power fails or crane runs beyond safe limits on runway, has been developed by Wagner Electric Corp., 6400 Plymouth Ave., St. Louis 14, Mo. The brake, which is automatically applied when operator pulls the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Loads up to 2 tons can be lifted by one man. The load brake holds positively till released. Where I beam trolleys are used, loads can be moved with ease by one man.

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main line switch, is released by full application of foot pedal. This compresses the brake-setting spring, and the control unit holds it compressed until electric circuit to the unit is opened. The unit combines a hydraulic brake for service stops, a spring-set brake for parking and an automatically applied cushioned-stop brake for emergencies.

**Crane:** A new mobile full-swing boom, tractor-mounted crane which handles loads to 10 tons has been announced by the Hughes-Keenan Co., Mansfield, O. Booms of standard lengths

from 15 to 30 ft are furnished. Ball bearing boom turntable and all gears and clutches run in oil, fully enclosed. Boom swing and hoist and load hoist are all independent actions, with separate controls and automatic brakes on the various models.

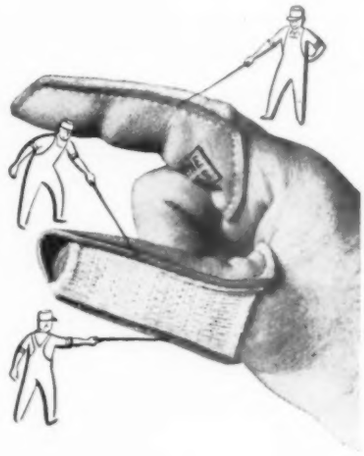
**Facing Material:** Delta Oil Products Co., Milwaukee 9, Wis., is marketing a new product developed for foundry use as a seacoal replacement material for green sand facing. It is composed of a specially prepared pure hydrocarbon which is said to be completely volatile at elevated temperatures. Ash is 0.2 per cent maximum, and on decomposition excessive free carbon is not produced. Amount used ranges from ½ to ¾ per 100 lb sand. Advantages claimed for the material include uniformity of product; elimination of ash and free carbon; reduction of gas, smoke soot and dirt; prevention of scabbing, buckling, rat-tailing and cutting, improvement of casting finish, etc.

**Lifting Clamp:** Merrill Bros., 46-18 Arnold Ave., Maspeth, N. Y., announces a flat surface safety lifting clamp, which picks up and securely holds heavy plates, barrels or other containers, stampings or welded assemblies, or any metal with sufficient flat surface to enable its jaws to engage same. Cantilever basic principle actuates the one jaw, the stationary jaw being of special construction, allowing the wedge power and grip. Drop forged from shackle to gripping jaws, the clamps come in four sizes, ½, 1, 3 and 6 ton capacities, taking up to 2 in. in thickness. Grip is effected in horizontal or vertical positions when load is applied in lifting or pulling applications.

**Silicone Varnish:** Dow Corning Corp., Midland, Mich., announces a new heat stable, waterproof silicone varnish for impregnating electrical equipment. It is said to afford greater protection against failure due to sustained overloads; increased service life of electrical insulation; higher permissible operating and ambient temperatures; increased protection against moisture; elimination of fire hazards resulting from failure of conventional insulation, and increased power output per unit weight.

**Dew-Point Recorder:** Surface Combustion, Toledo, O., is offering a new dew-point recorder especially applicable for furnaces utilizing prepared gas atmospheres, or wherever dehydrated air or gas mixture of controlled moisture content is desirable. It provides a virtually continuous record of humidity within a temperature range of minus 70 to plus 60 F.

**Finger Guard:** Industrial Gloves Co., Danville, Ill., is offering an improved finger guard with leather working face and comfortably fitting elastic webbing back for buffing, polishing, grinding, punch press and assembly work, sanding, and other uses. The new guards may be worn on any finger



or thumb by mechanics, grinders, buffers, or machine operators, or on the back or side of fingers to protect knuckles from blisters, raps, cuts and abrasions. The sizes are small, medium and large, and the materials cowhide split, grain leather and lightweight capeskin.

**Motor Grease:** Westinghouse Electric Corp., 306 Fourth Ave., Pittsburgh 30, Pa., has perfected an improved grease for ball and roller bearing motors, available in an eight ounce nasal type tube for lubrication from 13 F to 176 F, speeds up to 3600 rpm, and for horizontal or vertical operation. Stable, highly resistant to oxidation, the grease will remain indefinitely in bearings without drying out, caking or separating.

**Film Processing:** General Electric X-Ray Corp., 175 Jackson Blvd., Chicago 4, Ill. is offering two new units for accuracy in x-ray film processing. A lever-type timer, in an all-metal case black or ivory finished, accurately times any interval from 15 seconds to two hours. Hands are easily set from the

front. The timer is started and clear-toned alarm is wound by giving the lever a quarter-turn downward. A heavy, crystal-clear glass thermometer, specifically designed for darkroom use, is calibrated in Fahrenheit, showing one-degree solution temperature variations throughout its scale.

**Inspection Lamp:** Harmon & Co., 6 North Michigan Ave., Chicago 2, Ill., announces a new miniature inspection lamp, which protects user against shock by supplying power through a rubber insulated wire cable to a transformer enclosed in a bakelite handle. A built-in push button type transformer lamp handle, for ac, a 10-ft plug-in cord, two rigid and two flexible extensions of varying length that can be used in combination or separately and four screw-in miniature tungsten bulbs of varying sizes comprise the standard set. Additional extensions with lengths up to 32 in. in flexible, semi-rigid, rigid and rigid angle construction are also available, as well as special lamps, cord lengths, and mounting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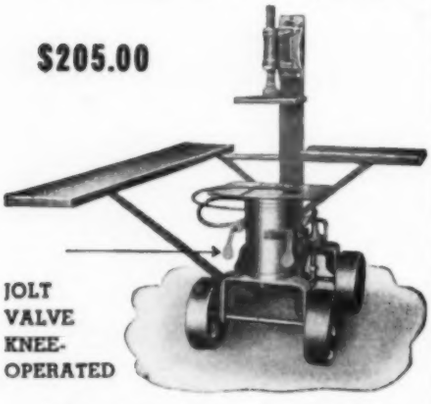

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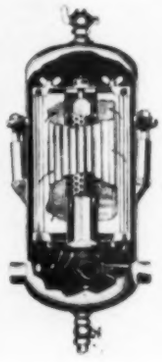
**MILWAUKEE (West Allis) WISC**


or hand brackets. A small reflecting mirror, for inspection of areas not in direct line of vision, is another supplement.

**Liquid Filter:** Dollinger Corp., Rochester 3, N. Y., announces a new model liquid filter with insert assembly consisting of inner and outer radial finned



forms of wire cloth. Outer form, on which filtering medium is crimped, slips over inner form. Top and bottom plates and seal gaskets are then applied and the assembly held in place by through bolts. The new filter permits the use of practically any type of filtering medium obtainable in sheet form that can be crimped, as well as quick change or replacement of filtering medium in the field.

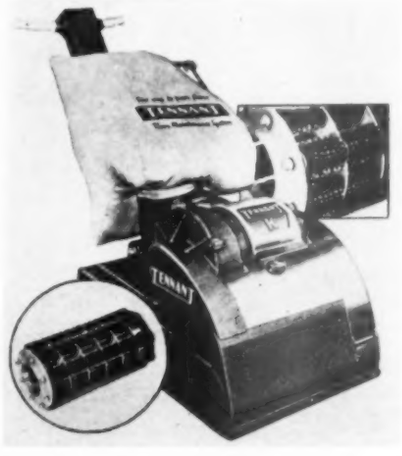
**Machine Mountings:** Bushings Inc., Coolidge Highway at 14 Mile Rd., Royal Oak, Mich., is offering a complete line of rubber insulated dual purpose machinery mountings for stopping vibration from machinery of any size, type, or weight, also for leveling machinery. They are manufactured in nine sizes ranging in load capacities of from 10 to 2000 lb each, for use on punch presses, compressors, blowers, grinders, buffers, etc. Synthetic rubber insulating material separates an outer shell, forming base of the mounting, from an inner cylindrical member, to which is fastened a single stud. Two nuts, one for adjusting machine to exact level desired, the other for locking in the leveled position, are supplied with each mounting. Brackets permit installation of mountings without materially raising elevation of the machine.

**X-Ray Tube:** Machlett Laboratories Inc., Springdale, Conn., has produced experimentally a new x-ray tube which emits x-radiation from a hemispherical window throughout the entire 180-degree solid angle with an intensity in excess of 5 million roentgen units per minute. A smaller version of this tube, providing over 2 million units is commercially available.

**Gage Blocks:** Fonda Gage Co., Stamford, Conn., is offering tungsten-carbide gage blocks in sets of 35 pieces ranging in size from 0.001 to 4.000 in. They are said to have wear resistance at least 100 times greater than that of steel gage blocks and 98 times greater than chrome-plated blocks. Improved wringing qualities also are said to be incorporated.

**Hammer Faces:** Greene, Tweed & Co., 4377 Bronx Blvd., New York 66, has developed a line of new faces for its replaceable face hammers which are made of a recently developed material which does not chip, is not affected by solvents and is noninflammable and nonexplosive. It does not mushroom, shrink, expand or come apart. The new faces are adapted to all soft-face hammer uses, such as assembly, foundry, caulking and diesinking work, also work on light and soft metals. They can be used until worn down to the head of the hammer, after which they can be quickly replaced by simply loosening a single nut.

**Floor Machine:** G. H. Tennant Co., 2530 Second St., Minneapolis 11, Minn., has developed a special 6-hp gasoline or electric self-propelling floor machine equipped with a heavy drum-mounted rotary cutter attachment which




revolves at 1750 rpm and has a hammer mill pulverizing and chipping action which shears incrusted grime from floors. The cutter attachment consists of a drum housing with approximately 350 alloy steel cutters mounted in horizontal rows around the drum's circumference. Each cutter has 18 teeth, sharp or blunt as desired, and rotates freely on a hardened steel shaft. The machine also removes unsound sections of wood or concrete floors in floor-laying operations, and levels concrete slabs prior to application of mastic cement or other material.

**Fluorescent Lamp:** Westinghouse Lamp Division, Bloomfield, N. J., has developed a new formula for making and mixing phosphor crystals which produce the regular daylight and white light, furnishing a color known as "4500 degree white," which refers to color temperature measurement on the Kelvin scale. The formula provides a clear white light of a color quality approaching daylight, making it more suitable for general indoor lighting service. The lamps are offered in 40 and 100-watt sizes, the two most popular fluorescent lamps for industrial and commercial applications.

**Core Oven:** Despatch Oven Co., 619 Eighth St., Minneapolis 14,

Minn., is offering its two-section batch type oven for installations where efficient baking and loading flexibility are required. The oven may be loaded with four small racks, two small and one large rack, or two large racks. This gas-fired unit uses forced convection and recirculation, and incorporates a new type of duct system with adjustable scoop-type ports which is said to provide unusual uniformity of baking. Where ceiling space is limited the heating unit, blower and automatic controls may be placed on the side, as in the accompanying installation, rather than on top of the oven in the conventional manner.

**Ceramic Material:** General Ceramics & Steatite Corp., Keasbey, N. J., has developed a new ceramic material, designated as M-244, adaptable to such applications as in high-temperature furnaces, insulation for high precision instruments in which dimensional changes must be minimized, and for many electrical and electronic purposes demanding a low thermal expansion coefficient in high quality ceramic parts. The new product's coefficient of thermal expansion is F. 1.6 x 10-6 up to 600 F. and F. 1.9 x 10-6 up to 1000 F. Modulus of rupture, 5 in. span, is 9200; 2 in. span, 11,500. Other technical data include: Dielectric constant (1000 kc) 5.30; power factor .540 per cent; dielectric strength 90 v/Mil. Material withstands a temperature of 2500 F, and can be supplied in any shapes that can be formed by pressing, extruding or casting.

**Dressing Tool:** A new supercut diamond circle set for dressing abrasive wheels has been introduced by Industrial Abrasives Inc., 3724 West 38th St., Chicago 32, Ill., which is especially designed for rugged service on jobs requiring fast dressing and long tool life. Consisting of three parts, the circle set insert, impregnated with diamonds, ⅛ x ⅛ in., the holder and one set screw, the tool contains over five carats of diamonds, uniformly distributed in the insert. The set is used either horizontally or vertically against abrasive wheel. As a flat spot is worn on diamond insert, the set screw is released, insert rotated and the dressing action repeated.

## Southern California Lecture Course

Southern California Chapter of the AFA has announced a lecture course it will conduct in Los Angeles to further interest in steel castings. Planned for attendance of producers as well as engineers and users of ferrous and nonferrous castings, it will consist of five lectures to be given Monday evenings starting Jan. 28.

The course will be under the direction of John E. Wilson, Climax Molybdenum Co., as chairman of the executive committee. Other committee chairmen include: Robert Gregg, Reliance Regulator Corp., papers committee; W. D. Bailey Jr., Westlectric Castings Co., publication and publicity committee; Glenn V. Ballard, Federated Metals Division, American Smelting & Refining Co., finance committee; and Paul E. Crow, Los Angeles Steel Castings Co., house committee. In addition to Messrs. Gregg and Bailey, the executive committee also includes Robert R. Haley, Advance Aluminum & Brass Co., and Albert G. Zima, International Nickel Co.

Outline of courses is as follows: Jan. 28, 1946, lecturer, E. K. Smith, metallurgical consultant, Beverly Hills, Calif.; subject, "Specifications." Feb. 4, lecturer, J. A. Burgard, Columbia Steel Corp., Los Angeles; subject, "Patterns." Feb. 11, lecturer, N. J. Dunbeck, Eastern Clay Products, Eifort, O.; subject, "Mold and Core Materials." Feb. 18, lecturer, Fred G. Sefing, International Nickel Co., New York; subject, "Gating and Risering Practice." Feb. 25, lecturers, Edward G. Smyth, Standard Oil Co. of California, Los Angeles, and C. E. Lloyd, Consolidated Steel Corp., Shipbuilding Division, San Pedro, Calif.; subject, "Inspection and Repairs."

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# NEW TRADE PUBLICATIONS...

POSTER: "The Spirit of '46," a poster 27½ x 44 in., lithographed in eight colors, is offered by Hercules Powder Co., Wilmington 99, Del., to those companies who would like to post it on their bulletin boards. The painting, by the late N. C. Wyeth, recalls the famous painting, "The Spirit of '76," because of its timely theme—three returned veterans leaving work after their first day on the job.

OXYGEN: "Making Your Own Oxygen," a booklet recently published by Air Products Inc., Manufacturers Road, Chattanooga 5, Tenn., explains its method of producing oxygen at low costs, and illustrates the equipment required.

SILICONES: Dow Corning Corp., Post Office Box 592, Midland, Mich., describes, in a 12-page catalog recently published, a line of silicones including fluids, greases and compounds, resins, varnishes and silicone rubber. In all forms the silicones extend permissible operating temperatures far above and below those at which comparable organic materials are serviceable.

REFRACTORY COATING: Brickseal Refractory Co., 1029 Clinton St., Hoboken, N. J., offers a new bulletin describing a refractory coating which is applied to refractory brickwork or plastic refractories by paint brush or spray gun. Composed of high-fusion clays and metal oxides combined in oils, the coating fuses under heat to form a highly glazed, monolithic protective covering over the entire refractory structure. Suitable for protection of oil, gas, or coal fired equipment the coating is adaptable to all types of boilers, incinerators, industrial heat-treating furnaces and similar high-temperature equipment.

WELDING AND CUTTING: An up-to-date price list and catalog of gas welding and cutting supplies and accessories has recently been published by Air Reduction, 60 East 42nd St., New York 17. Illustrations, descriptions, engineering data and current prices of welding rods, brazing and welding flux, hose, brazing alloys, goggles, gloves, sparklighters and tips are included.

MOTION PICTURES: "Movies Go To Work," a booklet giving reasons for adopting motion pictures as a management tool, has been published by Bell & Howell Co., 7100 McCormick Rd., Chicago 45, Ill. Divided into five headings, Training Salesmen, Selling Your Product, Increasing Production, Improving Personnel Relations, and Interpreting Your Material, the booklet gives an idea of the importance of sound films in industry.

WELDING: Ampco Metal Inc., Milwaukee 4, has issued a welding technique bulletin describing methods of welding with coated aluminum bronze weldrods, which also contains a weldability chart for copper base alloys that shows the range of metals that can be successfully welded with the weldrod. Copies of the bulletin are available on request.

OVEN FURNACES: W. S. Rockwell Co., 200 Eliot St., Fairfield, Conn., offers five new catalogues, 413E, 413L, 413G, 417 and 419, devoted to descriptive details and charts showing electric, oil fired and gas fired standard ovens, and gas, oil or electric oven furnaces for use with protective atmospheres, as well as roller hearth furnaces.

METALLIZING GUN: Bulletin No. F-1A, recently published by the Metallizing Co. of America, describes a new metallizing gun for high-speed metal spraying. The circular gives complete information on construction features, including exploded view of gun parts, spraying speeds and gas consumption, together with equipment necessary for a complete metallizing setup.

BERYLLIUM: An attractive two-color leaflet recently issued by the Brush Beryllium Co., 3714 Chester Ave., Cleveland 14, O., gives comprehensive information on the advantages and applications of beryllium. No longer under allocation, beryllium copper alloys, available as ingots, shot or powders, are described, as well as beryllium metal, aluminum alloys, nickel alloys and beryllium oxide as a high temperature refractory.

OIL BURNERS: Peabody Engineering Corp., 580 Fifth Ave., New York 19, has issued Bulletin No. 109, describing a new constant differential wide range oil burning system. It explains how the system achieves efficient combustion over a range in capacity as great as 50 to 1, controlling any number of burners throughout all variations in capacity.

CONTROL SYSTEM: Viking Instruments Inc., Stamford, Conn., in Data Sheet R-18, has announced a safety control system for the shutdown of diesel engines when temperature of the circulating-water system becomes too high, or when there is insufficient lubricating oil pressure. The data sheet contains information on operation, with drawings of arrangements, installation and operating instructions of the control-system which is self-operating and requires no electrical power or additional accessories.

POWER SAWS: DeWalt Products Corp., Fountain Ave., Lancaster, Pa., offers a new technical manual which brings to woodworking men a reference guide on the use of radial power saws for all kinds of wood cutting operations. The three radial movements of the saw are explained with instructions for setting up the unit.

CENTRALIZED LUBRICATION: — "When You Reconvert Install Modern Lubrication," a 4-page illustrated folder, issued by the Farval Corp., 3249 80th St., Cleveland 4, O., sets forth basic advantages of a centralized lubricating system for machine installations. A complete range of Farval systems, including manual and automatic types, are illustrated.


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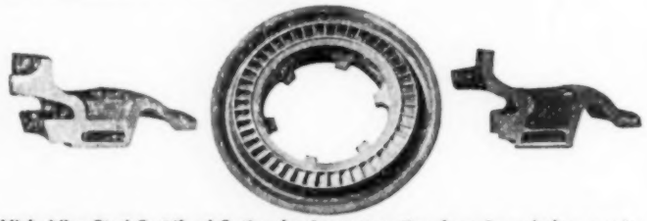

High Alloy Steel Centrifugal Casting showing cross sections formerly made from a series of forgings. Thin section 1/16-inch—100 per cent X-Ray Inspection.

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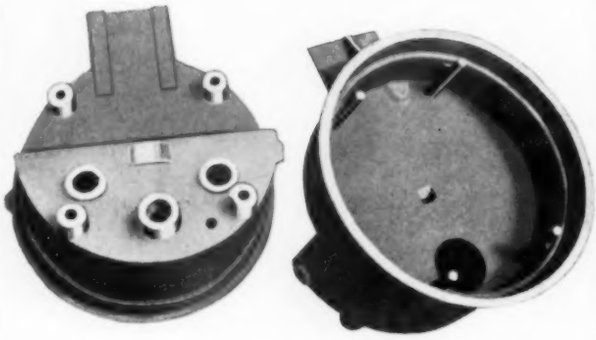
Mall PORTABLE POWER TOOLS

# These Castings



# Are Sealed and Impregnated with WATERLOX

These aluminum castings for washing machinery were protected by Waterlox Transparent on the vulnerable surfaces of the chambers subject to washing solutions, hot water, and alkalies.

Waterlox seals all types of metal castings against the wear of hot oil, sludge, and grit. Write for specifications.

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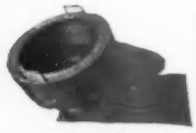
2636 East 76th St. Cleveland 4, Ohio

## CENTRIFUGAL CASTING MACHINES

Model AS



Model J

Model M

Model J-P

These machines used to make ferrous and non-ferrous centrifugal castings are produced by the pioneer manufacturer of such equipment.

They are made in a large variety of styles and a wide range of sizes. Complete technical information is supplied concerning sand and permanent mold design, gating, sand mixes, speeds, etc.

Send us drawings or sketches of parts you are interested in casting centrifugally, and we will tell you, without obligation, if and how our machines can cast them faster, cleaner and with fewer rejects.

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P. O. Box 947 Tulsa 1, Okla.

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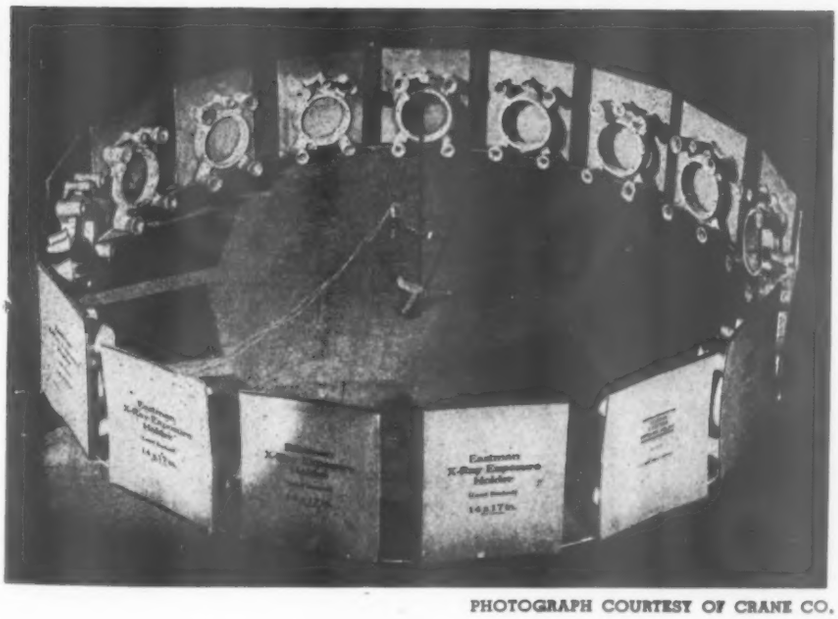

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*Write us concerning any problem of Gamma Ray Radiography*

"Directional solidification" can easily be studied by the set-up illustrated in the photograph—to indicate the best method of casting with a minimum of defects in the casting itself.

Radium has become a new foundry tool which directly effects an increase in yield. It permits accurate determination of the proper procedure in gating and risering "tough" castings. Seventeen cylindrical castings were radiographed simultaneously by Crane Co. to ascertain the most productive and economical foundry practice.

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It is SAHARA!!

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Review the records which we'll be glad to send you and JUDGE!

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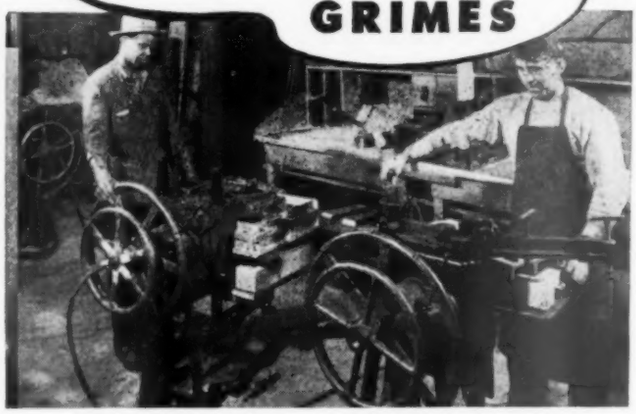
**FOUNDRIES LARGE AND SMALL DEPEND ON GRIMES**



● Everywhere large, medium and small foundries are depending on Grimes Molding Machines to produce superior molds demanded by critical war contracts. Beside the Grimes Hand Rammed Roll-Over Machine (shown above) there are Hand Rammed Power Roll-Over Machines and Jolt Powered Roll-Over Machines to meet every molding need. Learn to *depend on Grimes for your* foundry needs. Ask for complete data.

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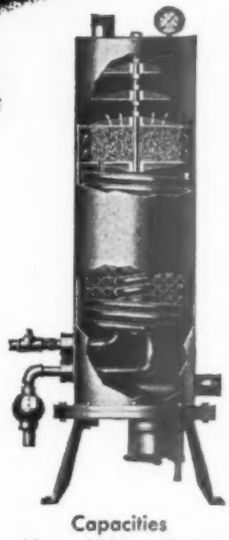
**THIS IS THE MURPHY AFTERCOOLER-SEPARATOR-FILTER ★ GUARANTEED**



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Guaranteed, like all Murphy products, to do the job . . . and wear. Removes all moisture and oil from compressed air lines and delivers it to the point of use clean, cool and dry.

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Capacities
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GUARANTEED COMPRESSED AIR PRODUCTS

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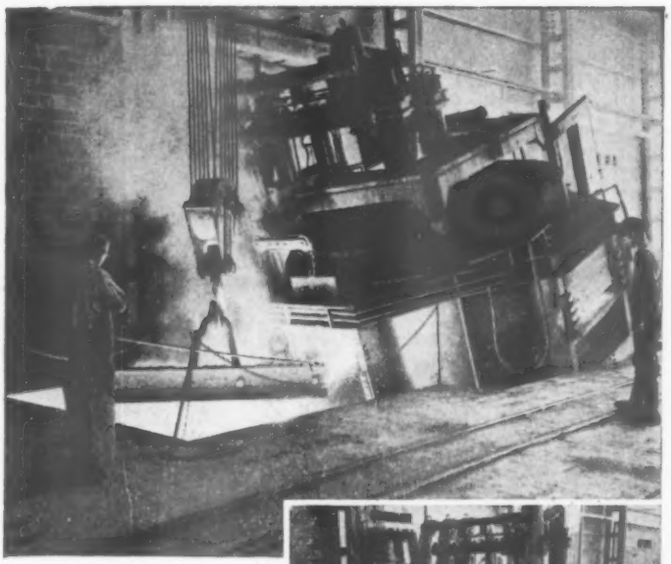
*Moisture Elimination Up To 3000 Pounds Per Square Inch*



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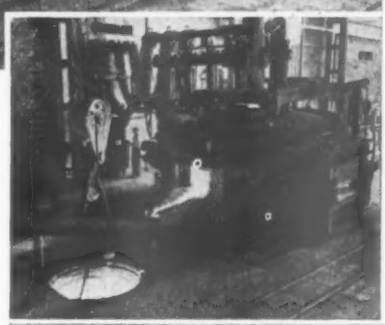

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AMERICAN BRIDGE Heroult Electric Furnaces now embody novel and distinctive features—the result of constant striving to perfect the most modern and economical tool for efficient melting and refining of iron and steel for casting, high grade alloy, tool and stainless steels.

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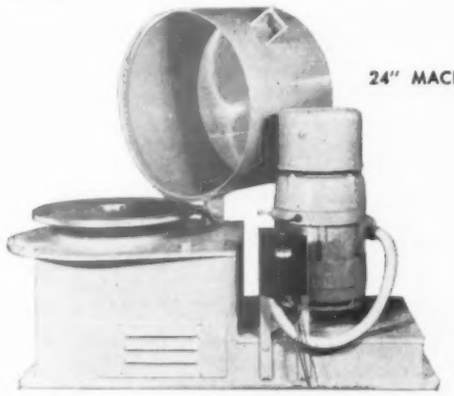
For better castings, increase furnace yield, less scrap, reduced machining cost.

We have engineers available to make complete studies to determine investment, production cost, and make recommendations.



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NO. 44 HEAVY DUTY PORTABLE

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*for Handling and Pouring*

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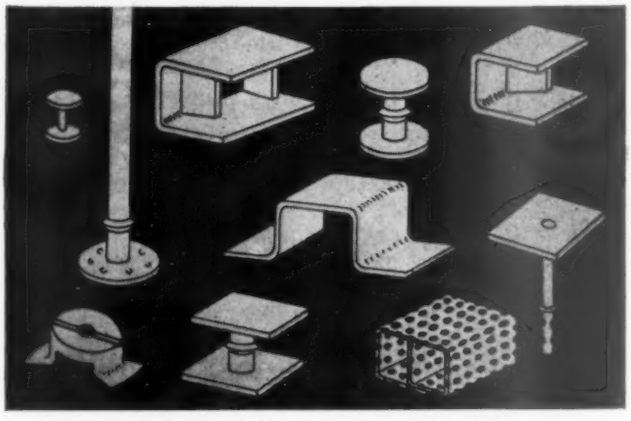
There's always one Chaplet that's best for each job

***ARE YOU SURE YOU'RE USING IT?***



The large variety of "Buffalo" Chaplet designs enables you to meet your needs *exactly*. Given this broad selection, you are always assured of greater strength, easier burning-in and higher resistance to chilling for each specific job.

*CATALOG NO. 12* offers complete details on designs, sizes and gauges. Copies mailed promptly. Samples of any "Buffalo" Chaplet will be gladly furnished.

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Single- and Multi-Stage

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Special Adaptations as Gas Boosters

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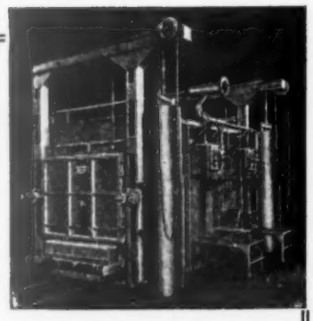

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Oil or gas fired—Ample chamber above top of charge for equalization of gases. Streamlined design. Heavy steel frame steel-cased construction. Roller bearings for car axles and door hoist shafts. Many other practical features.

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The use of "CLEANBLAST" Shot and Grit assures the maintenance of high production of all types of castings, at the same time doing an outstanding cleaning job in foundries all over the country.

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Guard against failure in core support and avoid costly rejects and make-overs. Cleveland Chaplets give you dependable protection. Made in Coil Head, Square head, Stem and Double-Head types.

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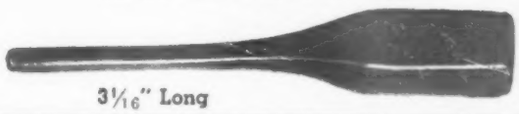
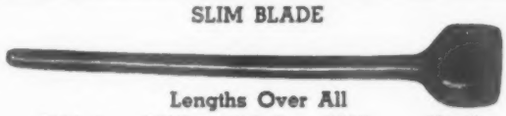


3 1/16" Long

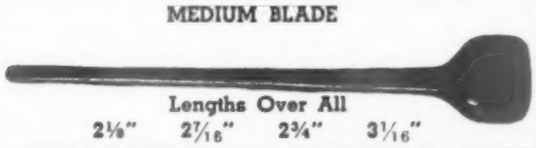
SLIM BLADE



Lengths Over All

1 1/16" 2 1/8" 2 7/16" 2 3/4" 3 1/16"

MEDIUM BLADE



Lengths Over All

2 1/8" 2 7/16" 2 3/4" 3 1/16"

JUMBO PATTERN

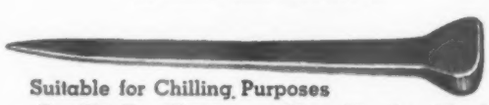
3 1/16" Long

HORSE NAIL BLADE

Lengths Over All

2 1/8" 2 3/8" 2 5/8" 2 7/8"

HORSE NAIL SECONDS



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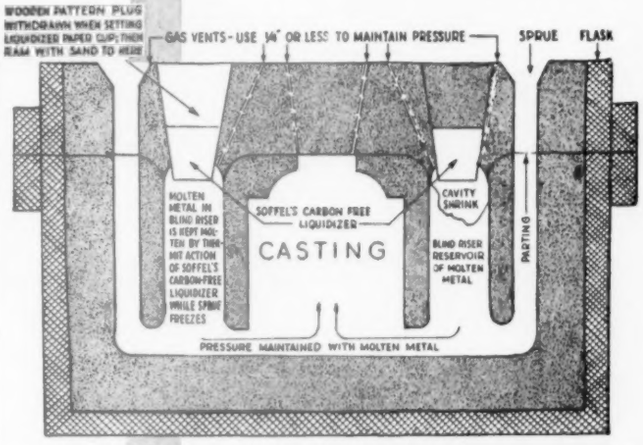
WOODEN PATTERN PLUG WITHDRAWN WHEN SETTING
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SPRUE
FLASK
MOLTEN METAL IN BLIND RISER IS KEPT MOLTEN BY THERMIT ACTION OF SOFFEL'S CARBON-FREE LIQUIDIZER WHILE SPRUE FREEZES
SOFFEL'S CARBON FREE LIQUIDIZER
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CAVITY SHRINK
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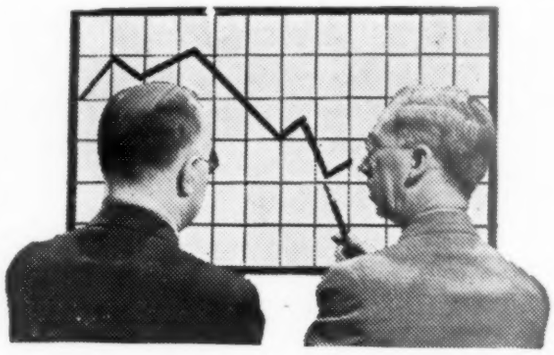

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The successful operation of a foundry depends upon the ability to develop methods of decreasing costs and increasing production.

A CONOVER survey will point the way to profitable procedure.

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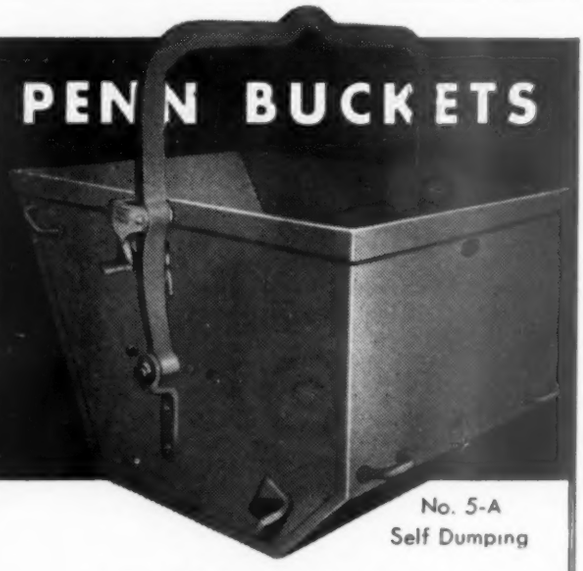

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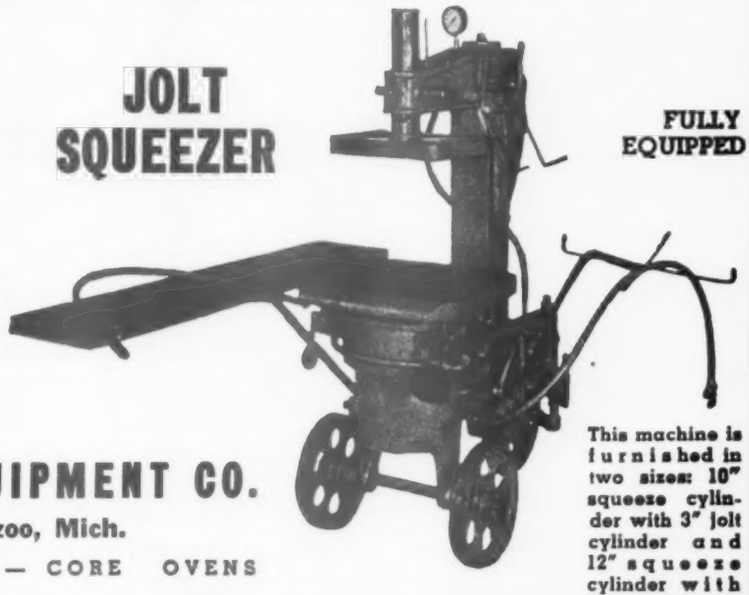
# HAYNES EQUIPMENT—

• The post and squeeze cylinder on the HAYNES JOLT SQUEEZER is cast all in one piece. There are no bolts or screws in this machine. The top of the post is machined on top with a 2 7/16" cold rolled shaft which the swing arm swings on.

This is a portable machine with three wheels, two in front, one in back, zerk fittings on all moving parts. Comes equipped with air gauge, pop-off gauge and a pin on top of the arm for a gate horn.

## JOLT SQUEEZER

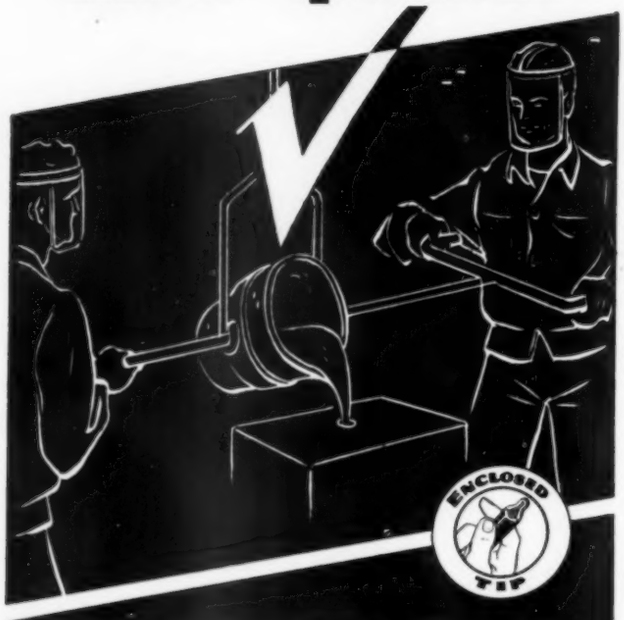
FULLY EQUIPPED



This machine is furnished in two sizes: 10" squeeze cylinder with 3" jolt cylinder and 12" squeeze cylinder with 4" jolt cylinder.

**HAYNES FOUNDRY EQUIPMENT CO.**
1734 Lake Street—Kalamazoo, Mich.
LADLES — BRASS FURNACES — CORE OVENS

# Check every melt quicker




A little care in checking pouring temperatures of nonferrous molten metals will assure big returns in better castings, fewer rejects, less time loss, and lowered production costs. On this, the whole foundry industry is now agreed.

Marshall Enclosed-Tip Thermocouples have helped in establishing this universal practice of temperature checking. With a Marshall Thermocouple, temperatures of metals in both furnace and ladle can always be determined accurately, and without delay.

Due to their patented, protected tips, Marshall instruments are not injured by molten metals or slag. Write for descriptive Folder: "A Tip on Foundry Savings". L. H. Marshall Co., 270 W. Lane Ave., Columbus 2, Ohio.

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**THERMOCOUPLES**

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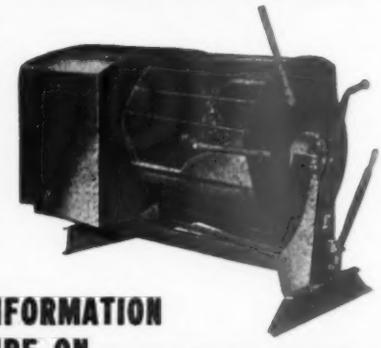
Fast, dependable core sand Mixers. Triple mixing hoes assure thorough action. Flared drum forquickeasycharging and discharge. Available with replaceable full hard abrasion resisting drum liner at slight extra cost.



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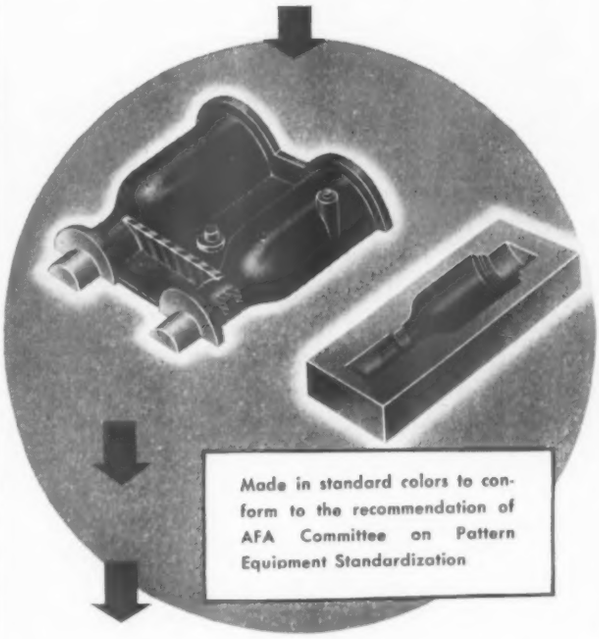


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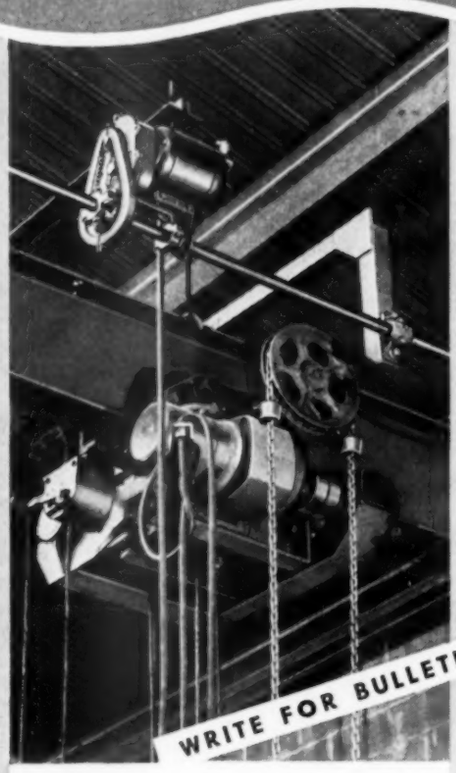


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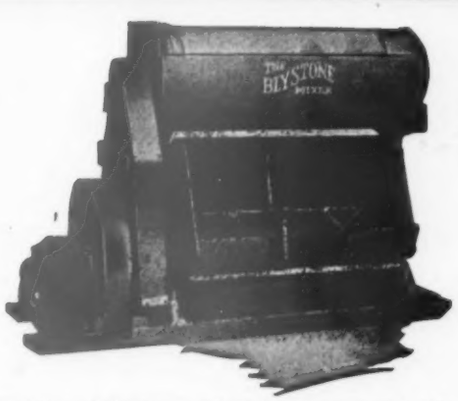


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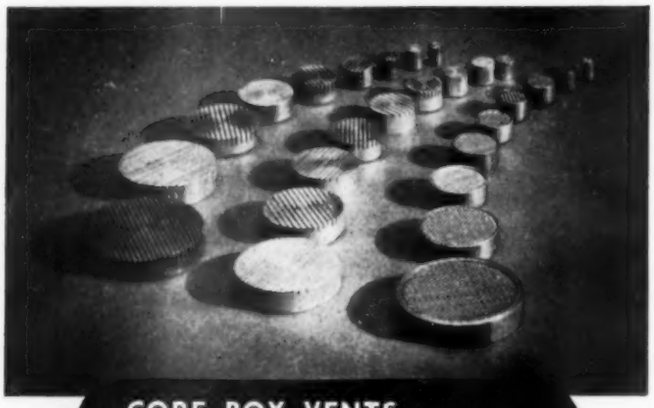

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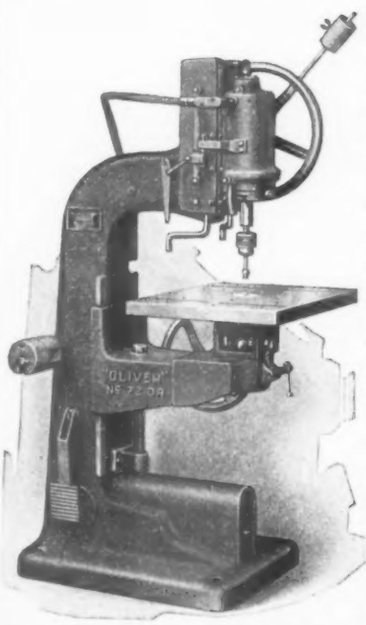
## Pattern Router and Borer



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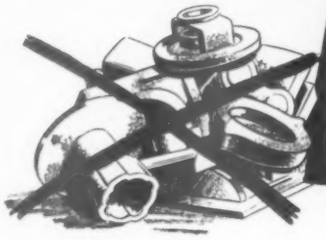

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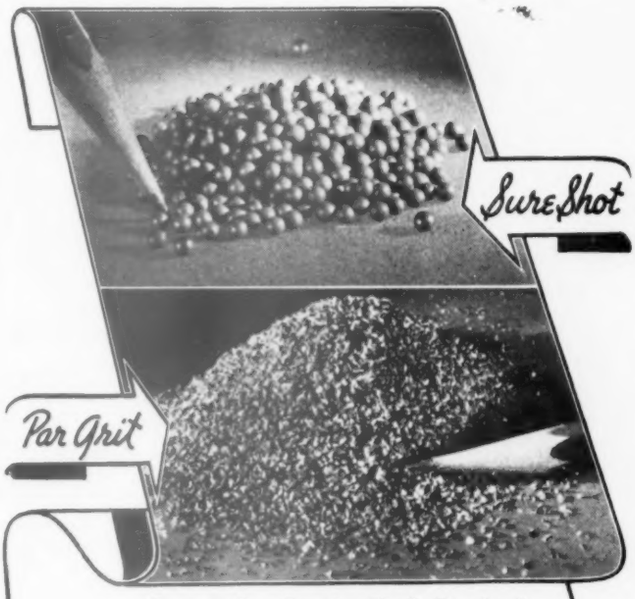


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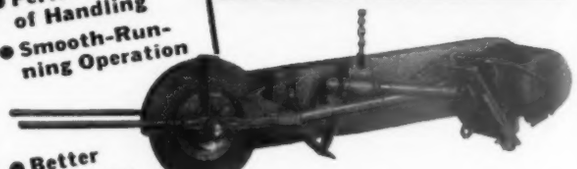

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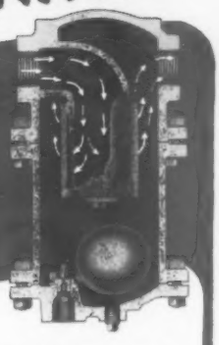

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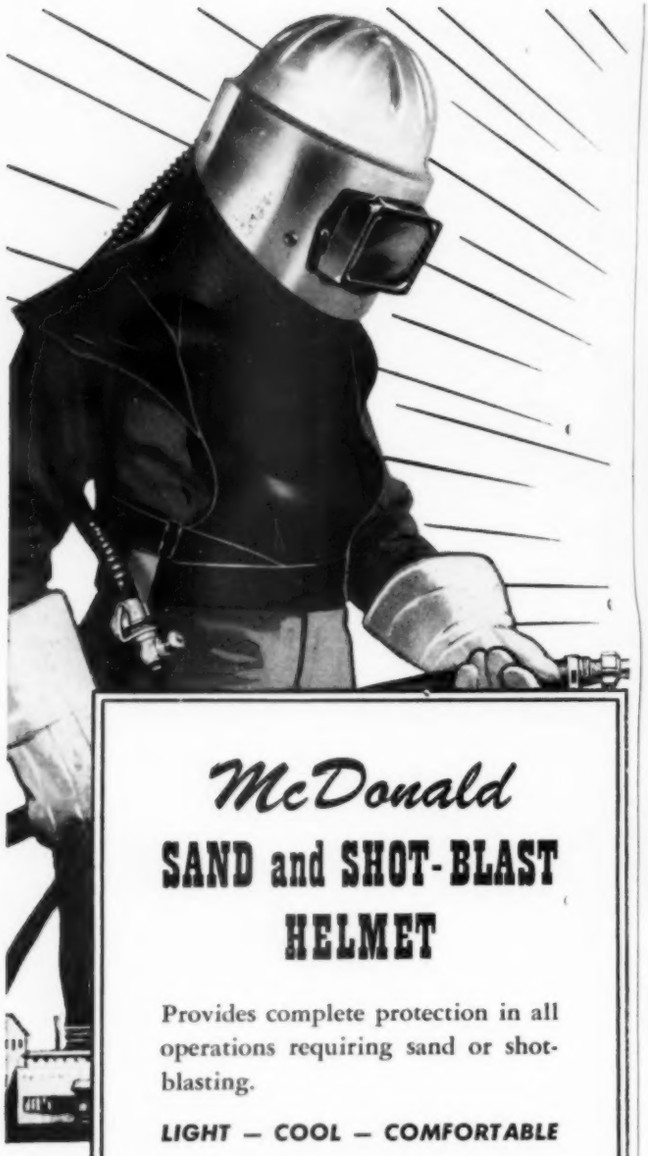

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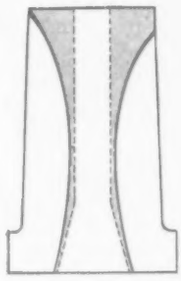
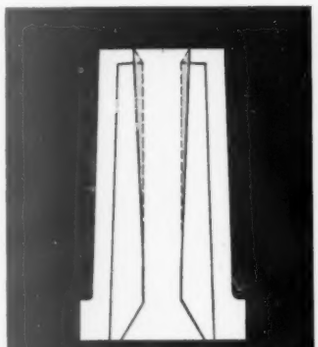
WHAT A DIFFERENCE A GOOD NOZZLE MAKES



This illustration shows an iron nozzle after being used an hour or two. Note how the outlet has flared and how the inlet has worn. This lowers operating efficiency and tremendously increases compressed air costs.



Here is an illustration of an American-Norbide nozzle after several hundred hours of service. The outlet has worn only ¼", but the inlet, where the actual air consumption is governed, has enlarged only .002".

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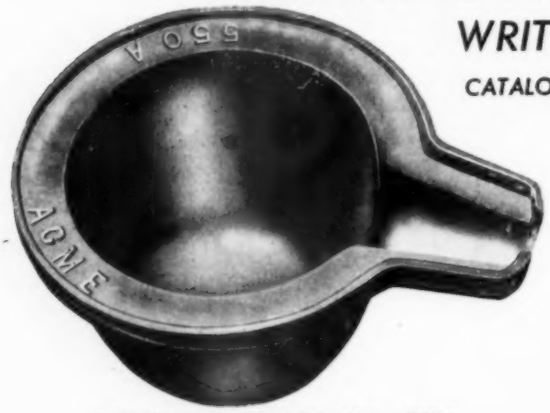


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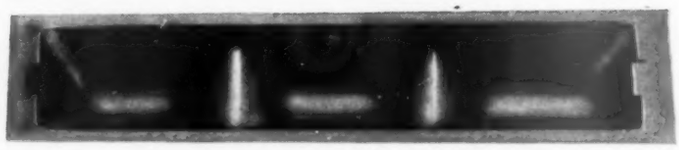
WITH 1½" COLLAR ON FLANGE

HOLDING
BOWL NO. HP7001



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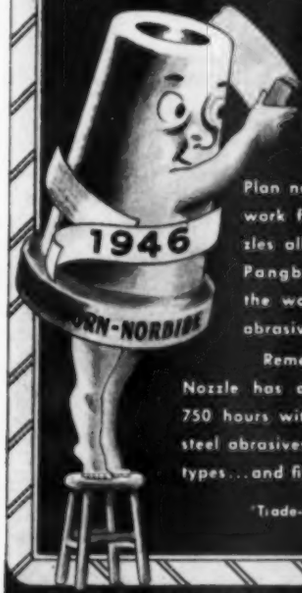


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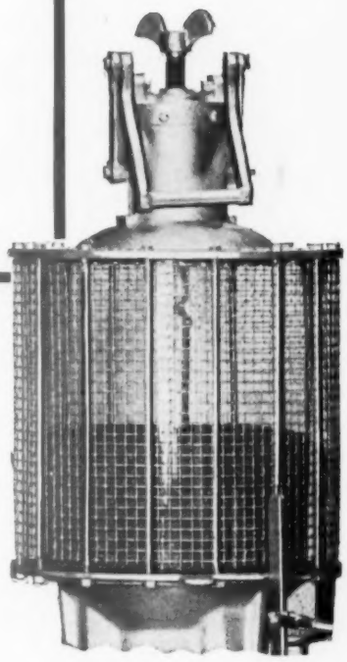

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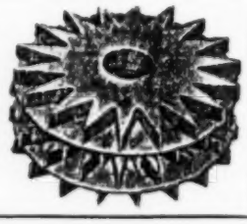

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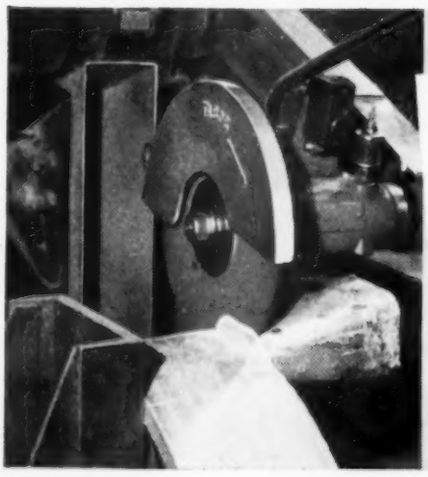

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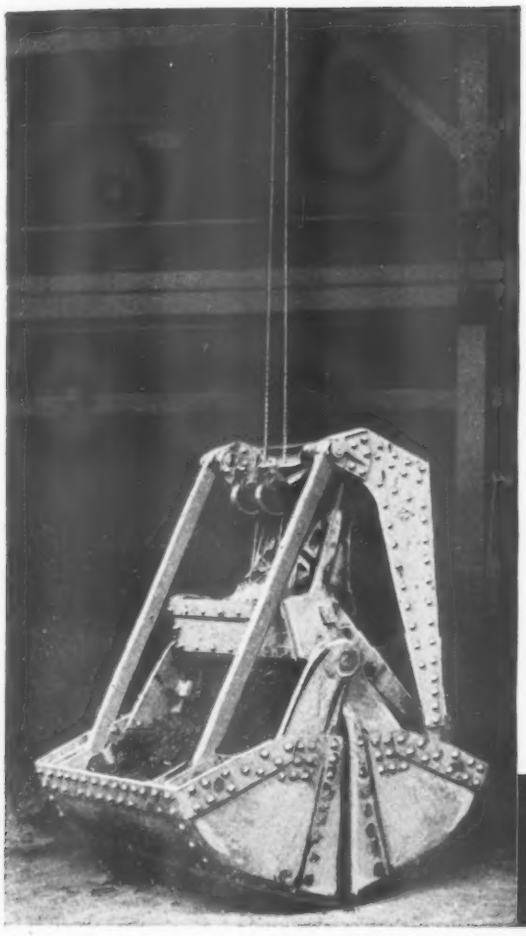

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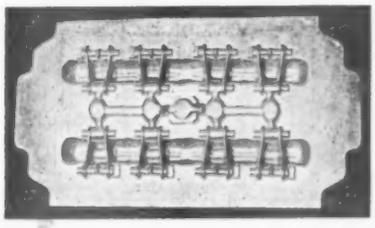

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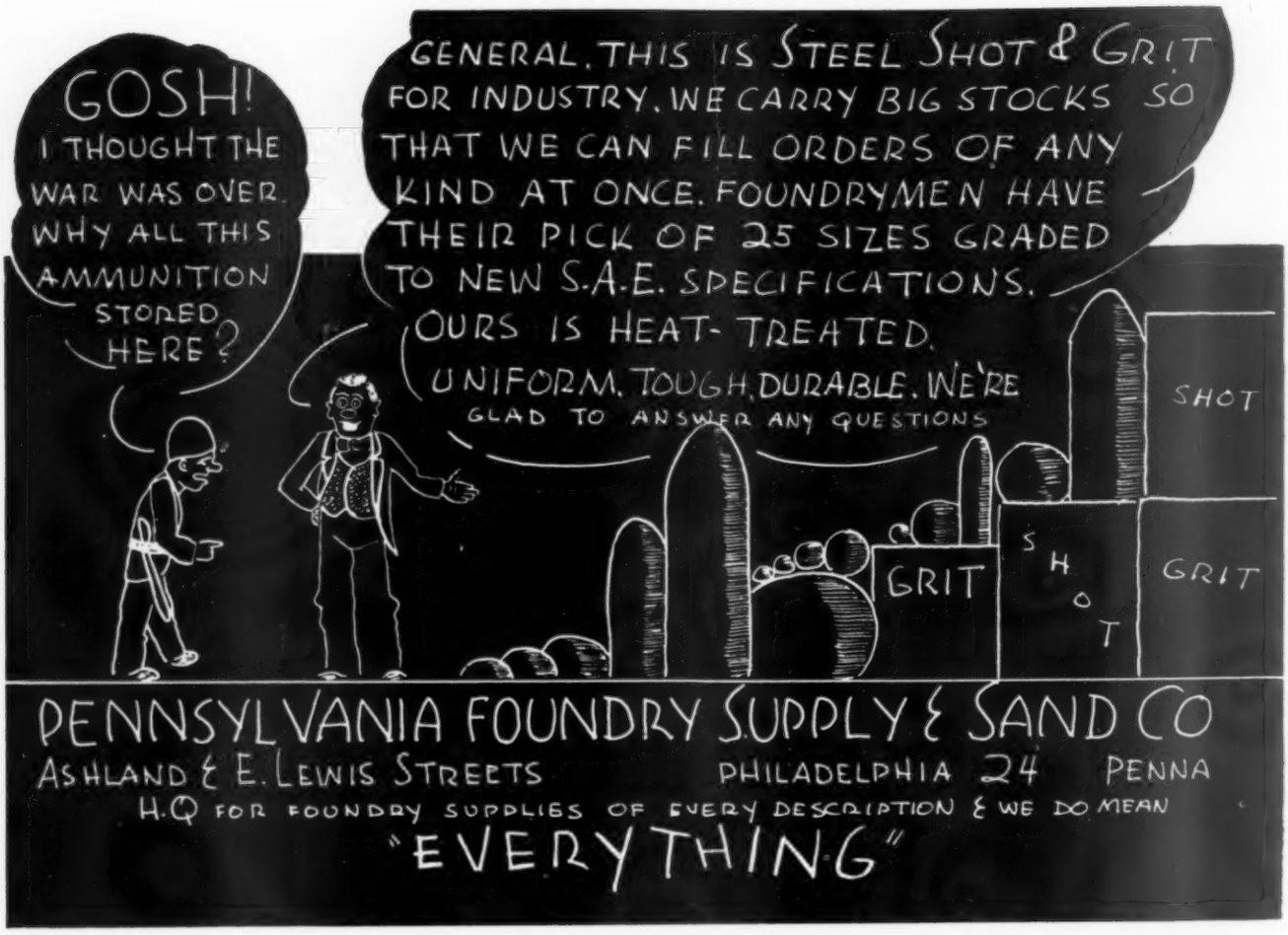
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**DIES**

Acme Aluminum Alloys Inc. 232 N. Findlay St., Dayton 3, O.
City Pattern Foundry & Machine Co., 1161 Harper Ave., Detroit 11, Mich.

**DOWEL PINS**

Standard Horse Nail Corp., New Brighton, Pa.

**DRILLS (Pneumatic)**

Cleveland Pneumatic Tool Co., 3781 East 77th St., Cleveland 5, O.
Gardner-Denver Co., Gardner Drive, Quincy, Ill.
Schramm Inc., West Chester, Pa.

**DRIVES (Reciprocating)**

Ajax Flexible Coupling Co., Westfield, N. Y.

**DRUMS (Magnetic)**

Dings Magnetic Separator Co., 512 E. Smith St., Milwaukee 7, Wis.
Stearns Magnetic Mfg. Co., 662 S. 28th St., Milwaukee 4, Wis.

**DUMP HOPPERS**

Roura Iron Works, 1405 Woodland Ave., Detroit 11, Mich.

**DUST ARRESTING EQUIPMENT**

American Air Filter Co., Inc., 266 Central Ave., Louisville 8, Ky.
American Foundry Equipment Co., 505 S. Byrkit St., Mishawaka, Ind.
Bartlett & Snow, C. O., Co. 6201 Harvard Ave., Cleveland 5, O.
Buell Engineering Co., 14 Cedar St., New York 5, N. Y.
Kirk & Blum Mfg. Co., 2838 Spring Grove Ave., Cincinnati 25, O.
Mahon, R. C., Co., 8650 Mt. Elliott Ave., Detroit 11, Mich.
Pangborn Corp., Hagerstown, Md.
Parsons Engineering Corp., Cleveland 4, O.
Peters-Dalton Inc., 17900 Ryan Rd., Detroit 12, Mich.
Ruemelin Mfg. Co., 3850 N. Palmer St., Milwaukee 12, Wis.
Schneible Co., Claude B., 2827—25th St., Detroit 16, Mich.
Sly Mfg. Co., W. W., 4753 Train Ave., Cleveland 2, O.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Tabor Mfg. Co., 6225 Tacony St., Philadelphia 35, Pa.
Whiting Corp., 15607 Lathrop Ave., Harvey, Ill.

**DUST COUNTING INSTRUMENTS**

McDonald Co., B. F., 1248 South Hope St., Los Angeles 15, Calif.

**DUST RECOVERY SYSTEMS**

American Foundry Equipment Co., Mishawaka, Ind.
Buell Engineering Co., 14 Cedar St., New York City 5.
Kirk & Blum Mfg. Co., 2838 Spring Grove Ave., Cincinnati 25, O.
Whiting Corporation, 15607 Lathrop Ave., Harvey, Ill.

**ELECTRIC FURNACES (See Furnaces, Electric)**

**ELECTRODES (Graphite and Amorphous)**

International Graphite & Electrode Corp., St. Marys, Pa.
National Carbon Co. Inc., Electrode Sales Div., 30 E. 42nd St., New York 17.

**ELECTRODES, WELDING (Steel and Alloy)**

Phillips, C. E., & Co., 2750 Poplar St., Detroit, Mich.

**ELEVATORS**

Standard Conveyor Co., North St. Paul 9, Minn.

**ELEVATORS (Bucket)**

Bartlett & Snow Co., C. O., 6201 Harvard Ave., Cleveland 5, O.
Chain Belt Co., 1671 W. Bruce St., Milwaukee 4, Wis.
Jeffrey Mfg. Co., 907 N. Fourth St., Columbus 16, O.
Link Belt Co., 300 W. Pershing Rd., Chicago 9, Ill.
Manhattan Rubber Mfg. Div. of Raybestos Manhattan Inc., Passaic, N. J.

**ELEVATORS (Material Handling)**

Chain Belt Co., 1671 W. Bruce St., Milwaukee 4, Wis.
Link Belt Co., 300 W. Pershing Rd., Chicago 9, Ill.

**ELEVATORS (Pneumatic, Material Handling)**

Fuller Company, Catasaqua, Pa.

**ENGINEERING SERVICE (Foundry)**

Associated Engineers Inc., 230 E. Berry St., Fort Wayne 2, Ind.
Carman, Edwin S., Lee Rd. at Mayfield, Cleveland 18, O.
Conover Engineering Co., 1740 East 12th St., Cleveland 14, O.
Emerson Engineers, The, 30 Rockefeller Plaza, New York, N. Y.
Giele, Walter, Co., First National Bank Bldg., Lebanon, Pa.
Kawin Co., Chas. C., 431 S. Dearborn St., Chicago 5, Ill.
Lester B. Knight & Associates, 120 So. LaSalle St., Chicago 3, Ill.
Reichert, W. G., Engineering Co., 1060 Broad St., Newark, N. J.
Wickland Co., A. A., 205 W. Wacker Dr., Chicago 6, Ill.

**EXHAUST SYSTEMS**

American Air Filter Co., Inc., 266 Central Ave., Louisville 8, Ky.
American Foundry Equipment Co., 505 S. Byrkit St., Mishawaka, Ind.
DeBothezat Ventilating Div., American Machine & Metals Co., East Moline, Ill.
Kirk & Blum Mfg. Co., 2838 Spring Grove Ave., Cincinnati 25, O.
Pangborn Corporation, Hagerstown, Md.
Parsons Engineering Corp., Cleveland 4, O.
Peters-Dalton Inc., 17900 Ryan Rd., Detroit 12, Mich.
Propellair Inc., Springfield, O.
Schneible Co., Claude B., 2827—25th St., Detroit 16, Mich.
Sly Mfg. Co., W. W., 4753 Train Ave., Cleveland 2, O.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Whiting Corporation, 15607 Lathrop Ave., Harvey, Ill.

**EYE SHIELDS and GOGGLES—See Goggles**

McDonald Co., B. F., 1248 South Hope St., Los Angeles 15, Calif.

**FABRICATORS (Metal)**

Kirk & Blum Mfg. Co., 2838 Spring Grove Ave., Cincinnati 25, O.
Roura Iron Works, 1405 Woodland Ave., Detroit 11, Mich.

**FACINGS**

Delta Oil Products Co., Milwaukee 9, Wis.
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
National Carbon Co. Inc., Carbon Products Div., 30 E. 42nd St., New York 17, N. Y.
Pacific Graphite Works, 40th & Linden Sts., Oakland 8, California.
Pennsylvania Foundry Supply & Sand Co., Ashland & E. Lewis St., Philadelphia 24, Pa.
Stevens Inc., Frederic B., Detroit 26, Mich.
United States Graphite Co., Saginaw, Mich.
Woodison Co., E. J., 7515 St. Aubin Ave., Detroit 11, Mich.

**FANS (Ventilating, Exhaust, Cooling, etc.)**

American Foundry Equipment Co., 505 S. Byrkit St., Mishawaka, Ind.
DeBothezat Ventilating Div., American Machine & Metals Co., East Moline, Ill.
General Blower Co. 406 N. Peoria St., Chicago 22, Ill.

**FANS (Ventilating, Exhaust, Cooling, etc.) (Cont'd.)**

Kirk & Blum Mfg. Co., 2838 Spring Grove Ave., Cincinnati 25, O.
Mahr Mfg. Co., Div. of Diamond Iron Works, Minneapolis, Minn.
Pangborn Corp., Hagerstown, Md.
Propellair Inc., Springfield, O.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

**FEEDERS (Rotary)**

Fuller Company, Catasaqua, Pa.
Link Belt Co., 300 W. Pershing Rd., Chicago 9, Ill.

**FEEDERS (Sand)**

Bartlett & Snow Co., C. O., 6201 Harvard Ave., Cleveland 5, O.
Jeffrey Mfg. Co., 907 N. Fourth St., Columbus 16, O.
Link Belt Co., 300 W. Pershing Rd., Chicago 9, Ill.

**FERROBORON**

Molybdenum Corp. of America, Pittsburgh 19, Pa.

**FERROCHROME**

Hickman-Williams & Co., Cleveland, O.
Electro Metallurgical Sales Corp., 30 E. 42 nd St., New York 17, N. Y.
Ohio Ferro-Alloys Corp., Canton 2, O.
Vanadium Corp. of America, 420 Lexington Ave., New York, N. Y.

**FERROMANGANESE**

Bethlehem Steel Co., Bethlehem, Pa.
Electro Metallurgical Sales Corp., 30 E. 42nd St., New York 17, N. Y.
Ohio Ferro-Alloys Corp., Canton 2, O.

**FERROMOLYBDENUM**

Climax Molybdenum Co., 500 Fifth Ave., New York 18, N. Y.
Molybdenum Corporation of America, Pittsburgh 19, Pa.

**FERROSILICON**

Chromium Mining & Smelting Corp., Sault Ste. Marie, Ont.
Electro Metallurgical Sales Corp. 30 E. 42nd St., New York 17, N. Y.
Globe Iron Co., Jackson, Ohio.
Jackson Iron & Steel Co., Jackson, O.
Keokuk Electro Metals Co., 429 So. 4th St., Keokuk, Iowa
Miller & Company, 332 S. Michigan Ave., Chicago 4, Ill.
Ohio Ferro-Alloys Corp., Canton 2, O.
Vanadium Corp. of America, 420 Lexington Ave., New York, N. Y.

**FERROTITANIUM**

Vanadium Corp. of America, 420 Lexington Ave., New York, N. Y.

**FERROTUNGSTEN**

Electro Metallurgical Sales Corp., 30 E. 42nd St., New York 17, N. Y.
Molybdenum Corp. of America, Pittsburgh 19, Pa.

**FERROVANADIUM**

Electro Metallurgical Sales Corp., 30 E. 42nd St., New York 17, N. Y.
Vanadium Corp. of America, 420 Lexington Ave., New York, N. Y.

**FILMS (X-Ray)**

Eastman Kodak Co., Rochester, N. Y.
General Electric X-Ray Corp., 2012 Jackson Blvd., Chicago 12, Ill.
Picker X-Ray Corp., 300 Fourth Ave., New York City 1.

**FILTERS (Air)**

American Air Filter Co., 266 Central Ave., Louisville 8, Ky.

**FIRE BRICK**

Babcock & Wilcox, 85 Liberty St., New York 6, N. Y.
Carborundum Co., Perth Amboy, N. J.
Chicago Retort & Firebrick Co., 208 So. LaSalle St., Chicago 4, Ill.
Electro Refractories & Alloys Corp., Vars Bldg., Buffalo 2, N. Y.
Illinois Clay Products Co., Joliet, Ill.
Ironton Fire Brick Co., Ironton, O.
Norton Co., Worcester 6, Mass.
Pennsylvania Foundry Supply & Sand Co., Ashland & E. Lewis St., Philadelphia 24, Pa.
Stevens, Inc., Frederic B., Detroit 26, Mich.

**FIRE CLAY**

Eastern Clay Products, Inc., Elfort, O.
Illinois Clay Products Co., Joliet, Ill.
Ironton Fire Brick Co., Ironton, O.

**FIRE SAND**
Carborundum Co., Niagara Falls, N. Y.
Cleveland Quarries Co., Guildhall Bldg., Cleveland 15, O.

**FIRESTONE**
Cleveland Quarries Co., Guildhall Bldg., Cleveland 15, O.

**FLASKS (Aluminum)**
Adams Co., 700 Foster St., Dubuque, Iowa.
Fremont Flask Co., Fremont, O.
Hines Flask Co., 1324 Hird Ave., Cleveland 7, O.

**FLASKS (Dowmetal)**
Fremont Flask Co., Fremont, O
Hines Flask Co., 1324 Hird Ave., Cleveland 7, O.

**FLASK FILLERS**
Jeffrey Mfg. Co., 907-99 N. Fourth St. Columbus 16, O.

**FLASKS (Slip)**
Adams Co., 700 Foster St., Dubuque, Ia.
Fremont Flask Co., Fremont, O.
Freeman Supply Co., Toledo 5, O.
Hines Flask Co., 1324 Hird Ave., Cleveland 7, O.

**FLASKS (Snap)**
Adams Co., 700 Foster St., Dubuque, Iowa.
Arcade Manufacturing Co., Freeport, Ill.
Diamond Clamp & Flask Co., Richmond, Ind.
Fremont Flask Co., Fremont, O.
Hines Flask Co., 1324 Hird Ave., Cleveland 7, O.
Stevens, Inc., Frederic B., Detroit 26, Mich.

**FLASKS (Steel)**
Sterling Wheelbarrow Co., 7100 W. Walker St., Milwaukee 14, Wis.
Truscon Steel Co., Youngstown 1, O.

**FLASK FITTINGS**
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
Hines Flask Co., 1324 Hird Ave., Cleveland 7, O.
Truscon Steel Co., Youngstown 1, O.

**FLASK LUMBER**
Dougherty Lumber Co., 4300 E. 66th St., Cleveland 5, O.

**FLASKS (Wood)**
Chicago Mfg. & Distributing Co., 1928 W. 46th St., Chicago 9, Ill.

**FLEXIBLE SHAFT MACHINERY**
Mall Tool Co., 7720 South Chicago Ave., Chicago 19, Ill.
Strand Co., N. A., 5001 N. Wolcott Ave., Chicago 40, Ill.
Wyzenbeek & Staff Inc., 838 W. Hubbard St., Chicago, Ill.

**FLOORING (Non-Slip)**
Norton Co., Worcester 6, Mass.

**FLUXES**
American British Chemical Inc., 180 Madison Ave., New York 16.
Cleveland Flux Co., 1026 Main St., Cleveland 13, O.
Mathieson Alkali Works, Inc., 60 E. 42nd St., New York 17, N. Y.
National Pigment Co., East York St., Philadelphia, Pa.
Niagara Falls Smelting & Refining Corp., 2204 Elmwood Ave., Buffalo 17, N. Y.
Pittsburgh Metals Purifying Co., 1352 Marvista St., Pittsburgh 12, Pa.

**FOUNDRY LAYOUT & METHODS**
Associated Engineers Inc., 230 E. Berry St., Fort Wayne 2, Ind.
Lester B. Knight & Associates, 120 So. LaSalle St., Chicago 3, Ill.

**FOUNDRY NAILS**
Capewell Mfg. Co., Hartford, Conn.
Standard Horse Nail Corp., New Brighton, Pa.

**FOUNDRY SHOES**
Hy-Test Shoe Co., Div. International Shoe Co., St. Louis, Mo.

**FOUNDRY SHOVELS**
(See SHOVELS)

**FOUNDRY SUPPLY HOUSES**
Combined Supply & Equipment Co., Inc., 215 Chandler St., Buffalo 7, N. Y.
Eastern Clay Products, Inc., Elfort, O.

**FOUNDRY SUPPLY HOUSES (Cont'd.)**
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
Freeman Supply Co., 1152 E. Broadway, Toledo 5, O.
Hoffman Foundry Supply Co., 1193 Main St., Cleveland, Ohio.
McCormick Co., J. S., 25th St. & A. V. R. R., Pittsburgh 22, Pa.
Midwest Foundry Supply Co., Edwardsville, Ill.
Pennsylvania Foundry Supply & Sand Co., Ashland & E. Lewis St., Philadelphia 24, Pa.
Stevens, Inc., Frederic B., Detroit 26, Mich.
Woodison Co., E. J., 7515 St. Aubin Ave., Detroit 11, Mich.

**FURNACE BOTTOMS**
Industrial Silica Corp., Youngstown, Ohio.

**FURNACES (Aluminum & Magnesium Billets)**
Dempsey Industrial Furnace Corp., Springfield 5, Mass.
Despatch Oven Co., Minneapolis 14, Minn.
Electric Furnace Co., Salem, Ohio
W. S. Rockwell Co., 56 Church St., New York 7, N. Y.

**FURNACES (Aluminum & Magnesium Forgings)**
Dempsey Industrial Furnace Corp., Springfield 5, Mass.
Despatch Oven Co., Minneapolis 14, Minn.
Electric Furnace Co., Salem, Ohio
Kirk Blum Mfg. Co., 2838 Spring Grove Ave., Cincinnati 25, O.
W. S. Rockwell Co., 56 Church St., New York 17, N. Y.

**FURNACES (Aluminum Melting)**
Ajax Engineering Corp., Trenton, N. J.
Dempsey Industrial Furnace Corp., Springfield 5, Mass.
Eclipse Fuel Engineering Co., 711 So. Main St., Rockford, Ill.
Romph Furnace Co., 7849 Hartwell, Dearborn, Mich.

**FURNACES (Aluminum Rivet Heating)**
Ajax Electric Co., Inc., Philadelphia 23, Pa.
Despatch Oven Co., Minneapolis 14, Minn.

**FURNACES (Annealing)**
Carl Mayer Corp., 3030 Euclid Ave., Cleveland 15, O.
Despatch Oven Co., Minneapolis, Minn.
Eclipse Fuel Engineering Co., 711 So. Main St., Rockford, Ill.
Electric Furnace Co., Salem, O.
Gehnrich Oven Div., W. S. Rockwell Co., 56 Church St., New York 7, N. Y.
Johnston Mfg. Co., Minneapolis 13, Minn.
Lindberg Engineering Co., 2448 West Hubbard, Chicago 12, Ill.
W. S. Rockwell Co., 56 Church St., New York 7, N. Y.
Vulcan Corporation, 18th & Cherry Sts., Philadelphia 3, Pa.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Whiting Corporation, 15607 Lathrop Ave., Harvey, Ill.

**FURNACES (Crucible Melting)**
Ajax Electrothermic Corp., Trenton, N. J.
Ajax Metal Co., Philadelphia 23, Pa.
Campbell-Hausfeld Co., 300-320 Moore St., Harrison, O.
Dempsey Industrial Furnace Corp., Springfield 5, Mass.
Eclipse Fuel Engrg. Co., 711 So. Main St., Rockford, Ill.
Fen Machine Co., 1350 Babbitt Road, Cleveland 17, Ohio.
Fisher Furnace Co., 5535 N. Wolcott Ave., Chicago 40, Ill.
Johnston Mfg. Co., Minneapolis 13, Minn.
Mahr Mfg. Co., Div. of Diamond Iron Works, Minneapolis, Minn.
W. S. Rockwell Co., 56 Church St., New York 7, N. Y.
Stroman Furnace & Engineering Co., 300 W. Adams St., Chicago 6, Ill.

**FURNACES (Electric Melting)**
Ajax Electrothermic Corp., Trenton, N. J.
Ajax Engineering Corp., Trenton, N. J.
Ajax Metal Co., Philadelphia 23, Pa.

**FURNACES (Electric Melting) (Cont'd.)**
American Bridge Co., Pittsburgh 19, Pa.
Detroit Electric Furnace Div. of Kuhlman Electric Co., Bay City, Mich.
Greene Electric Furnace Co., 2702—6th So. Seattle 4, Wash.
Pittsburgh Lectromelt Furnace Corp., P. O. Box 1125, Pittsburgh, Pa.
Swindell-Dressler Corp., Pittsburgh, Pa.
Whiting Corporation, 15607 Lathrop Ave., Harvey, Ill.

**FURNACES (Gas or Oil Fired)**
Campbell-Hausfeld Co., Harrison, O.
Carl-Mayer Corp., 3030 Euclid Ave., Cleveland 15, O.
Dempsey Industrial Furnace Corp., Springfield 5, Mass.
Electric Furnace Co., Salem, O.
Fen Machine Co., 1350 Babbitt Road, Cleveland 17, Ohio.
Fisher Furnace Co., 5535 N. Wolcott Ave., Chicago 40, Ill.
Haynes Foundry Equipment Co., 1734 Lake St., Kalamazoo 21, Mich.
Johnston Mfg. Co., Minneapolis 13, Minn
Lindberg Engineering Co., 2448 West Hubbard, Chicago 12, Ill.
Radiant Combustion Inc., Warren, Ohio.
W. S. Rockwell Co., 56 Church St., New York 7, N. Y.
Romph Furnace Co., 7849 Hartwell, Dearborn, Mich.
Stroman Furnace & Engineering Co., 300 W. Adams St., Chicago 6, Ill
Vulcan Corporation, 18th & Cherry Sts., Philadelphia 3, Pa.

**FURNACES (Gray Iron Melting)**
American Bridge Co., Pittsburgh 19, Pa.
Detroit Electric Furnace Div. of Kuhlman Electric Co., Bay City, Mich.
Pittsburgh Lectromelt Furnace Corp., P. O. Box 1125, Pittsburgh, Pa.
Swindell-Dressler Corp., Pittsburgh, Pa.
Whiting Corporation, 15607 Lathrop Ave., Harvey, Ill.

**FURNACES (Heat Treating)**
Ajax Electric Co., Inc., Philadelphia 23, Pa.
Carl-Mayer Corp., 3030 Euclid Ave., Cleveland 15, O.
Dempsey Industrial Furnace Corp., Springfield 5, Mass
Despatch Oven Co., Minneapolis 14, Minn.
Eclipse Fuel Engineering Co., 711 So. Main St., Rockford, Ill.
Johnston Mfg. Co., Minneapolis 13, Minn.
Lanly Company, 750 Prospect Ave., Cleveland 15, Ohio.
Lindberg Engineering Co., 2448 West Hubbard, Chicago 12, Ill.
Maehler, Paul Co., 2200 W. Lake St., Chicago 12, Ill.
Radiant Combustion Inc., Warren, Ohio.
W. S. Rockwell Co., 56 Church St., New York 7, N. Y.
Vulcan Corporation, 18th & Cherry Sts., Philadelphia 3, Pa.

**FURNACES, Heat Treating (Electric)**
Ajax Electric Co., Inc., Philadelphia 23, Pa.
Ajax Electrothermic Corp., Trenton, N. J.
Carl-Mayer Corp., 3030 Euclid Ave., Cleveland 15, O.
Dempsey Industrial Furnace Corp., Springfield 5, Mass.
Despatch Oven Co., Minneapolis 14, Minn.
Electric Furnace Co., Salem, Ohio
Lindberg Engineering Co., 2448 West Hubbard, Chicago 12, Ill.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

**FURNACES (Malleable Annealing)**
Dempsey Industrial Furnace Corp., Springfield 5, Mass.
Electric Furnace Co., Salem, O.
General Electric Co., Schenectady, N. Y.
Lindberg Engineering Co., 2448 West Hubbard, Chicago 12, Ill.
W. S. Rockwell Co., 56 Church St., New York 7, N. Y.

**FURNACES (Malleable Annealing) (Cont'd.)**
Whiting Corporation, 15607 Lathrop Ave., Harvey, Ill.
Young Brothers Co., 6508 Mack Ave., Detroit 7, Mich.

**FURNACES (Malleable Melting)**
American Bridge Co., Pittsburgh 19, Pa.
Pittsburgh Lectromelt Furnace Corp., P. O. Box 1125, Pittsburgh, Pa.
Whiting Corporation, 15607 Lathrop Ave., Harvey, Ill.

**FURNACES (Nonferrous Melting)**
Ajax Electrothermic Corp., Trenton, N. J.
Ajax Engineering Corp, Trenton, N. J.
Ajax Metal Co., Philadelphia 23, Pa
Campbell-Hausfeld Co., 300-320 Moore St., Harrison, O.
Dempsey Industrial Furnace Corp., Springfield 5, Mass.
Detroit Electric Furnace Div. of Kuhlman Electric Co, Bay City, Mich.
Eclipse Fuel Engineering Co., 711 So. Main St., Rockford, Ill.
Fen Machine Co., 1350 Babbitt Road, Cleveland 17, Ohio.
Fisher Furnace Co., 5535 N. Wolcott Ave., Chicago 40, Ill.
Haynes Foundry Equipment Co., 1734 Lake St., Kalamazoo 21, Mich.
Johnston Mfg. Co., Minneapolis 13, Minn.
Kindt-Collins Co., 12653 Elmwood Ave., Cleveland 11, Ohio.
W. S. Rockwell Co., 56 Church St., New York 7, N. Y
Romph Furnace Co., 7849 Hartwell, Dearborn, Mich.
Stroman Furnace & Engineering Co., 300 W. Adams St., Chicago 6, Ill.
Swindell-Dressler Corp., Pittsburgh, Pa.
Whiting Corp., 15607 Lathrop Ave., Harvey, Ill.

**FURNACES (Powdered Coal)**
Whiting Corp., 15607 Lathrop Ave., Harvey, Ill.

**FURNACES (Steel Melting)**
Ajax Electrothermic Corp., Trenton, N J.
American Bridge Co., Pittsburgh 19, Pa.
Detroit Electric Furnace Div. of Kuhlman Electric Co., Bay City, Mich.
Pittsburgh Lectromelt Furnace Corp., P. O. Box 1125, Pittsburgh, Pa.
Swindell-Dressler Corp., Pittsburgh, Pa.
Whiting Corporation, 15607 Lathrop Ave., Harvey, Ill.

**FURNACE BLOWERS**
Campbell-Hausfeld Co, Harrison, O.
Eclipse Fuel Engineering Co., 711 So. Main St., Rockford, Ill.
Fisher Furnace Co., 5535 N. Wolcott Ave., Chicago 40, Ill.
Roots-Connersville Blower Corp., Connersville, Ind.

**FURNACE LININGS**
Campbell-Hausfeld Co., Harrison, O.
Carborundum Co., Perth Amboy, N. J.
Electro Refractories & Alloys Corp., Vars Bldg., Buffalo 2, N. Y.
Fisher Furnace Co., 5535 N. Wolcott Ave., Chicago 40, Ill.
Ironton Fire Brick Co., Ironton, O.
National Carbon Co. Inc., Carbon Products Div., 30 E. 42nd St., New York 17, N. Y.
Stroman Furnace & Engineering Co., 300 W. Adams St., Chicago 6, Ill.
United States Graphite Co., Saginaw, Mich.

**GAGES**
Acme Aluminum Alloys Co. Inc., 232 N. Findlay St., Dayton 3, O.

**GAGGERS**
Federal Foundry Supply Co., 4600 E 71st St., Cleveland 5, O.

**GAS**
American Gas Association, 420 Lexington Ave., New York 17, N. Y.

**GAS (Oxygen, Acetylene, Industrial)**

Air Reduction Sales Co., 60 East 42nd St., New York 17, N. Y.
Liquid Carbonic Corp., 3110 S. Kedzie Ave., Chicago 23, Ill.

**GAS BURNERS**

Eclipse Fuel Engineering Co., 711 So. Main St., Rockford, Ill.
Fisher Furnace Co., 5535 N. Wolcott Ave., Chicago 40, Ill.
Mahr Mfg. Co., Div. of Diamond Iron Works, Minneapolis, Minn.
North American Mfg. Co., 2910 E. 75th St., Cleveland 4, O.

**GLOVES (Industrial, Safety)**

American Optical Co., Southbridge, Mass.
McDonald Co., B. F., 1248 South Hope St., Los Angeles 15, Calif.
Industrial Gloves Co., 203 Garfield Blvd., Danville, Ill.

**GOGGLES and EYE PROTECTORS**

American Optical Co., Southbridge, Mass.
McDonald Co., B. F., 1248 South Hope St., Los Angeles 15, Calif.
Mine Safety Appliances Co., Braddock, Thomas and Meade Sts., Pittsburgh 8, Pa.
Willson Products Inc., Reading, Pa.

**GRAPHITE**

Bloomsbury Graphite Co., Bloomsbury, N. J
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
International Graphite & Electrode Corp., St. Marys, Pa.
National Carbon Co. Inc., Carbon Products Div., 30 E. 42nd St New York 17, N. Y.
United States Graphite Co., Saginaw, Mich.

**GRINDERS (Electric Portable)**

Chicago Pneumatic Tool Co General Offices: 8 East 44th St., New York 17.
Independent Pneumatic Tool Co., 600 West Jackson Blvd., Chicago 6, Ill.
U. S. Electrical Tool Co., Cincinnati 4, O.

**GRINDERS (Flexible Shaft)**

Mall Tool Co., 7720 South Chicago Ave., Chicago 19, Ill.
N. A. Strand Co., 5001 N. Wolcott Ave., Chicago 40, Ill.

**GRINDERS (Pneumatic Portable)**

Chicago Pneumatic Tool Co., General Offices: 8 East 44th St., New York 17.
Cleveland Pneumatic Tool Co., 3781 East 77th St., Cleveland 5, O.
Independent Pneumatic Tool Co., 600 West Jackson Blvd., Chicago 6, Ill.
Keller Tool Co., Grand Haven, Mich.

**GRINDERS (Surface, Bench, Disc Floor)**

Fox Grinders, Inc., Oliver Bldg., Pittsburgh 22, Pa.
Independent Pneumatic Tool Co., 600 West Jackson Blvd., Chicago 6, Ill.
Kindt-Collins Co., 12653 Elmwood Ave., Cleveland 11, Ohio.
Mall Tool Co., 7720 South Chicago Ave., Chicago 19, Ill.
Safety Grinding Wheel & Mach. Co., Springfield, O.
N. A. Strand Co., 5001 N. Wolcott Ave., Chicago 40, Ill.
U. S. Electrical Tool Co., Cincinnati 4, O.

**GRINDERS (Swing Frame)**

Fox Grinders, Inc., Oliver Bldg., Pittsburgh 22, Pa.
Mall Tool Co., 7720 South Chicago Ave., Chicago 19, Ill.
Safety Grinding Wheel & Mach. Co., Springfield, O.

**GRINDING WHEELS—See ABRASIVE WHEELS**

**GRINDING WHEEL DRESSERS**

Carborundum Co., Niagara Falls, N. Y.
Calder Mfg. Co., 628 N. Prince St., Lancaster, Pa.
Collmer Bros., 420 So. St. Joseph, South Bend, Indiana
Desmond-Stephan Mfg. Co., Urbana, O.
Simonds Worden White Co., Dayton 7, O.
Western Tool & Mfg. Co., Springfield, O.

**GRINDSTONES**

Bay State Abrasive Products Co., Westboro, Mass.
Sterling Grinding Wheel Co., Tiffin, O.

**GRIT (Abrasive)**

Alloy Metal Abrasive Co., Ann Arbor, Mich.
American Foundry Equipment Co., 505 S. Byrkit St., Mishawaka, Ind.
American Steel Abrasives Co., Galion, O.
Carborundum Co., Niagara Falls, N. Y.
Cleveland Metal Abrasive Co., 887 E. 67th St., Cleveland, Ohio
Globe Steel Abrasive Co., Mansfield, O.
Pangborn Corp., Hagerstown, Md
Pittsburgh Crushed Steel Co., Pittsburgh 1, Pa.
Simonds Worden White Co., Dayton 7, O.
Western Metal Abrasive Co., 2545 East 79th St., Cleveland 4, Ohio

**HAMMERS (Chipping)**

Chicago Mfg. & Distributing Co. 1928 W. 46th St., Chicago 9, Ill.
Chicago Pneumatic Tool Co., General Offices: 8 East 44th St., New York 17.
Cleveland Pneumatic Tool Co., 3781 East 77th St., Cleveland 5, O.
Independent Pneumatic Tool Co., 600 West Jackson Blvd., Chicago 6, Ill.
Schramm Inc., West Chester, Pa.

**HAMMERS (Rawhide)**

Chicago Rawhide Mfg. Co., 1384 Elston Ave., Chicago 22, Ill.

**HAND PADS (Leather)**

Chicago Rawhide Mfg. Co., 1384 Elston Ave., Chicago 22, Ill.

**HARDNESS TESTING EQUIPMENT**

Harry W. Dietert Co., 9330A Roselawn Ave., Detroit 4, Mich.

**HEAT CONTROL AND RECORDING DEVICES**

Foxboro Company, Foxboro, Mass
Illinois Testing Laboratories, 418 N. LaSalle St., Chicago 10, Ill.
Lindberg Engineering Co., 2448 West Hubbard, Chicago 12, Ill.
Marshall Co., L. H., 270 W. Lane, Columbus 1, O.

**HEATERS (Direct Fired)**

Despatch Oven Co., Minneapolis 14, Minn.

**HEATERS (Gas, Oil, Electric)**

American Foundry Equipment Co., Mishawaka, Ind.
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Hill, Long Island 18, N. Y.

**VENTILATING SYSTEMS**

American Foundry Equipment Co.,
505 S. Byrkit St., Mishawaka, Ind.
DeBothezat Ventilating Div.,
American Machine & Metals Co.,
East Moline, Ill.
Kirk & Blum Mfg. Co., 2838 Spring
Grove Ave., Cincinnati 25, O.
Pangborn Corp., Hagerstown, Md.
Parsons Engineering Co.,
Cleveland 4, O.
Peters-Dalton Inc.,
17900 Ryan Rd.,
Detroit 12, Mich.
Schneible Co., Claude B.,
2827—25th St., Detroit 16, Mich.
W. W. Sly Mfg. Co., 4753 Train
Ave., Cleveland 2, O.
B. F. Sturtevant Co.,
Hyde Park, Boston, Mass.

**VENTS (Core Box)**

Champion Foundry & Machine Co.,
1314 W. 21st St.,
Chicago 8, Ill.
Demmler & Bros., Wm.,
Kewanee, Ill.
Reinacker Industries, 2035 Hilton
Rd., Ferndale, Mich.
C. M. Smillie & Co., 1100 Wood-
ward Hgts. Blvd., Ferndale, Mich.

**VIBRATORS**

Adams Co., 700 Foster St.,
Dubuque, Iowa.
Beardsley & Piper Co., The, 2541 N.
Keeler Ave., Chicago 39, Ill.
Cannon Vibrator Co., 111 Power
Ave., Cleveland 14, O.
Cleveland Vibrator Co., 2110 Supe-
rior Ave. W., Cleveland, O.
Davenport Machine & Foundry Co.,
Davenport, Iowa.
Foundry Supplies & Mfg. Co.,
2221 Orchard St., Chicago 14, Ill.
Freeman Supply Co., 1152 Broad-
way, Toledo 5, O.
Herman Pneumatic Machine Co.,
Union Bank Bldg.,
Pittsburgh 22, Pa.
Link Belt Co., 300 W. Pershing Rd.,
Chicago, Ill.
Martin Engineering Co.,
Kewanee, Ill.
Milwaukee Foundry Equipment Co.,
3238 W. Pierce St.,
Milwaukee, Wis.
New Haven Vibrator Co., 131 Chest-
nut St., New Haven 7, Conn.
Nicholls Co., Wm. H., Richmond
Hill, Long Island 18, N. Y.
Osborn Mfg. Co., 5401 Hamilton
Ave., Cleveland 14, O.
Pennsylvania Foundry Supply &
Sand Co., Ashland & E. Lewis
Sts., Philadelphia 24, Pa.
S P O Incorporated, 7500 Grand
Division Ave., Cleveland 5, O.
Syntron Company, Homer City, Pa.
Tabor Mfg. Co., 6225 Tacony St.,
Philadelphia 35, Pa.

**VIBRATORS (Core Bench)**

Cleveland Vibrator Co., 2110 Supe-
rior Ave. W., Cleveland, O.

**WASH ROOM EQUIPMENT**

Bradley Washfountain Co.,
2217 W. Michigan St.,
Milwaukee, Wis.

**WAX (Core, Vent, Pattern)**

Kindt-Collins Co.,
12653 Elmwood Ave.,
Cleveland 11, Ohio.
United Compound Co., Inc.,
328 South Park Ave.,
Buffalo 4, N. Y.

**WEDGES (Foundry)**

Chicago Mfg. & Distributing Co.,
1928 W. 46th St., Chicago 9, Ill.
Sterling Wheelbarrow Co., 7100 W.
Walker St., Milwaukee 14, Wis.

**WELDING GAS**

Air Reduction Sales Co., 60 East
42nd St., New York 17, N. Y.
Liquid Carbonic Corp., 3110 S. Ked-
zie Ave., Chicago 23, Ill.

**WELDING (Acetylene Generators)**

Sight Feed Generator Co.,
Richmond, Ind.

**WELDING APPARATUS (Electric Arc)**

Harnischfeger Corp., 4411 W. Na-
tional Ave., Milwaukee 14, Wis.
Sight Feed Generator Co.,
Richmond, Ind.
Westinghouse Electric & Mfg. Co.,
East Pittsburgh, Pa.

**WELDING and CUTTING APPARATUS and SUPPLIES**

Air Reduction Sales Co., 60 East
42nd St., New York 17, N. Y.
Liquid Carbonic Corp., 3110 S. Ked-
zie Ave., Chicago 23, Ill.

**WELDING ELECTRODES (Carbon)**

National Carbon Co., Carbon Prod-
ucts Div., 30 E. 42nd St.,
New York 17, N. Y.

**WELDING RODS & ELECTRODES**

Air Reduction Sales Co., 60 East
42nd St., New York 17, N. Y.
American Agile Corp., 5806 Hough
Ave., Cleveland 3, O.
International Nickel Co., Inc.,
67 Wall St., New York 5, N. Y.
Phillips, C. E., & Co., 2750 Poplar
St., Detroit, Mich

**WELDING RODS (Hard Facing)**

Coast Metals Inc., 2 West 45th St.,
New York City.

**WHEELBARROWS**

Construction Machinery Corp.,
Waterloo, Iowa.
Sterling Wheelbarrow Co., 7100 W.
Walker St., Milwaukee 14, Wis.

**WHEELS (Cut-off)**

West Co., Inc., 1117 Shackamaxon
St., Philadelphia 25, Pa.

**WHEELS (Wire)**

Osborn Mfg. Co., 5401 Hamilton
Ave., Cleveland 14, O.

**WIRE BRUSHES**

Independent Pneumatic Tool Co.,
600 West Jackson Blvd.,
Chicago 6, Ill.
Osborn Mfg. Co., 5401 Hamilton
Ave., Cleveland 14, O.

**WIRE NAILS**

Bethlehem Steel Co., Bethlehem, Pa.
Republic Steel Corp.,
Cleveland 4, O.

**WOODWORKING MACHINERY**

Freeman Supply Co., 1152 Broad-
way, Toledo 5, O.
Kindt-Collins Co.,
12653 Elmwood Ave.,
Cleveland 11, Ohio.
Oliver Machinery Co.,
Grand Rapids 2, Mich.

**X-RAY EQUIPMENT**

General Electric X-Ray Corp.,
Dept. N 37, 2012 Jackson Blvd.,
Chicago 12, Ill.
Kelley-Koett Mfg. Co.,
212 W. 4th St., Covington, Ky.
Magnaflux Corporation, 5910 North-
west Highway, Chicago 41, Ill.
Picker X-Ray Corp., 300 Fourth
Ave., New York 10, N. Y.
Westinghouse Electric & Mfg. Co.,
East Pittsburgh, Pa.
X-Ray Incorporated,
Book Tower,
Detroit, Mich.

**X-RAY FILMS**

Eastman Kodak Co.,
Rochester, N. Y.
General Electric X-Ray Corp.,
2012 Jackson Blvd.,
Chicago 12, Ill.
Picker X-Ray Corp., 300 Fourth
Ave., New York 10, N. Y.
X-Ray Incorporated,
Book Tower,
Detroit, Mich.

**X-RAY INSPECTION**

Kelley-Koett Mfg. Co.,
212 W. 4th St., Covington, Ky.
Magnaflux Corporation, 5910 North-
west Highway, Chicago 41, Ill.
Picker X-Ray Corp., 300 Fourth
Ave., New York 10, N. Y.
X-Ray Incorporated,
Book Tower,
Detroit, Mich.

**ZINC**

American Smelting & Refining Co.,
120 Broadway, New York 5, N. Y.

*—When writing advertisers, please mention* THE FOUNDRY—

# Classified Advertising

## Help Wanted

**SALES REPRESENTATIVE WANTED**

A reputable firm entering the national field with a superior grade nonferrous alloy desires representation in the following territories.

BOSTON, MASS.
RICHMOND, VA.
DALLAS, TEXAS
OKLAHOMA CITY, OKLA.
LOUIS, MO.
BUFFALO, N. Y.
PROVIDENCE, R. I.
SALT LAKE CITY, UTAH
PORTLAND, ORE.
SAN FRANCISCO, CALIF.

If interested, state present coverage and references. Established sales representatives preferred.

BOX 331

THE FOUNDRY CLEVELAND 13, OHIO

**FOUNDRY SUPERINTENDENT**

Gray iron jobbing foundry—squeeze, jolt, roll-over, etc., up to 5 ton floor work, with experience in brass and aluminum preferred. About 100 employees. Location Central Wisconsin progressive city 30,000 population. Must have foundry experience and be fully qualified to supervise all departments, handle men, understand and reduce costs. Do not apply if cannot meet these qualifications.

BOX 411

THE FOUNDRY CLEVELAND 13, OHIO

**STEEL FOUNDRY SUPERINTENDENT**

Middle West acid electric steel foundry needs man under 40, with college metallurgical training and enough all around experience to supervise all phases of steel casting manufacture. Address: Box 354, The FOUNDRY, Cleveland 13, Ohio.

**OFFICE MANAGER**

Man under 50, capable of setting up books and operating office and sales force for Middle West steel foundry. Address: Box 355, The FOUNDRY, Cleveland 13, Ohio.

**COREROOM FOREMAN**

Capable man to take complete charge of cores being made on a production basis. Must have experience and knowledge of sand mixes, etc. Give full details and reply as to experience, etc. Address: Box 400, The FOUNDRY, Cleveland 13, Ohio.

**PNEUMATIC TOOLS—FACTORY REPRESENTATIVES WITH SALES AND SERVICE ENGINEERING EXPERIENCE**

Old established manufacturer of pneumatic tools, now with expanded line of products is desirous of obtaining Factory Representatives. Give complete record of experience. Address: Box 138, The FOUNDRY, Cleveland 13, Ohio.

**FOUNDRY FOREMAN**

For foundry work production molding on Hand Floor. Experience, initiative and ability to handle men necessary. In reply give full details. Address: Box 401, The FOUNDRY, Cleveland 13, Ohio.

## Help Wanted

**GENERAL FOUNDRY FOREMAN**

Malleable Iron Foundry needs a man with sufficient experience and ability to handle help and to take charge of our Molding, Core Room and Melting operations.

FRAZER & JONES COMPANY
P. O. BOX 115
SYRACUSE, NEW YORK

**SALES ENGINEER**

One familiar with foundry practices and sales engineering to represent Foundry Equipment Company in Michigan and Ohio. In reply give personal history, qualifications, experience, availability and salary requirements.

BOX 432

The FOUNDRY CLEVELAND 13, OHIO

**FOUNDRY SUPERINTENDENT**

Needed for an old established gray iron jobbing shop pouring eight to ten tons daily of medium and small size castings. Location Middle West. Applicant must know the answers to foundry problems, have a background that will bear investigation and should be approximately forty years old. Good starting salary and future. Address: Box 389, The FOUNDRY, Cleveland 13, Ohio.

**MOLDING MACHINE FOREMAN**

Capable of overseeing jar squeeze machines with sand mixing and complete sand molding equipment included. Ability to handle men and check details of prime importance. State full particulars in reply. Address: Box 402, The FOUNDRY, Cleveland 13, Ohio.

**NONFERROUS FOUNDRY SUPERINTENDENT**

Top-notch man able to take full charge of large foundry in New York City. Man must be experienced in this field and have full knowledge of aluminum and bronze work. Attractive salary to right man. Write giving full details. Address: Box 428, The FOUNDRY, Cleveland 13, Ohio.

**NONFERROUS FOUNDRY SALESMAN**

Man with good following and contacts, able to secure large orders for large nonferrous foundry in New York City. Also district representatives wanted. Attractive proposition to right man. Write giving full details. Address: Box 429, The FOUNDRY, Cleveland 13, Ohio.

**DO SOMETHING WITH YOUR HANDS**

The Foundry Industry offers splendid opportunities right now and for a long future. To qualify as a capable craftsman is your guarantee of a respectable and remunerative occupation. If you have ever worked in a foundry or want to work with your hands, call upon your local foundries or address: Box 433, The FOUNDRY, Cleveland 13, Ohio.

**FOUNDRY FOREMAN**

Energetic and capable foundry foreman for a 30 molder grey iron production foundry in Northwestern Pennsylvania. Castings up to 40 lbs. using squeezers, rollovers and stripping machines. This foundry is operated by a well known and established business. Applicant should give full details as to age, education, training, experience, salary expected, etc. in first letter. Address: Box 371, The FOUNDRY, Cleveland 13, Ohio.

## Help Wanted

**FOUNDRY SUPERINTENDENT**

A jobbing foundry in New York State employing 50 molders is looking for a man who has demonstrated his ability to produce good castings on a fair cost basis and who knows the value of sound employee relations.

Must be practical in Melting-Molding and Core-making and the know how to Plan, Direct and Control.

To such a man we can offer an excellent salary and after proving his worth a good opportunity for advancement in our organization.

If you like to move around every year or two don't answer. If competent and interested, send complete history covering your experience, family status, etc. to:

BOX 341

THE FOUNDRY CLEVELAND 13, OHIO

**FOUNDRY FOREMAN FOR NIGHT GANG**

We want a good practical night foreman to take charge of our night crew of fifteen men; Sand cutters, chipping, and grinding of small to medium castings in a jobbing foundry located in Central New York.

We would like to get a man who speaks Polish or Italian and who has demonstrated his ability as a leader. To such a man we can offer a good salary and future.

Write giving your age, nationality, marital status and your past experience.

BOX 342

THE FOUNDRY CLEVELAND 13, OHIO

**GENERAL FOREMAN**

Medium sized grey iron foundry in middle west wants man with practical experience on general jobbing and machine molding. Castings from less than one pound to five ton. Must have ability to handle men and thoroughly understand rigging. Give age, experience, salary desired and when available. Address: Box 333, The FOUNDRY, Cleveland 13, Ohio.

**ASSISTANT FOUNDRY FOREMAN**

Real opportunity for aggressive young man to supervise directly, molding and pouring of light gray iron castings. Company has operated successfully for a great many years and a steady position, with future assured for the right applicant, is open for immediate acceptance. State experience and salary expected. Address: Box 419, The FOUNDRY, Cleveland 13, Ohio.

**FOUNDRY SUPPLY JOBBERS—ATTENTION**

Established manufacturer of air tool products with complete foundry line of air tools requires wider distribution for their products. If you are at present selling to foundries, please communicate with us. Address: Box 405, The FOUNDRY, Cleveland 13, Ohio.

**FACTORY ENGINEER**

Sixty-three year old Ohio manufacturing concern seeks services of Engineer with gray iron foundry experience, to study methods, all controls with object of assuming substantial management responsibility as soon as qualified. Energy, common sense and ability to get along with others are essential. Excellent opportunity. State age, education, experience and salary desired. Include recent snap shot or photograph, which will be returned. Address: Box 412, The FOUNDRY, Cleveland 13, Ohio.

# Classified Advertising

## Help Wanted

### A GREAT NEW MALLEABLE PLANT

Opportunity for good men—

| | |
|---|---|
| Supervisors | Tool Makers |
| Foremen | Electricians |
| Chemists | Millwrights |
| Metallurgists | Carpenters |
| Draftsmen | Machinists |
| Designers | Laborers |
| Nurses | Melters |
| Time & Motion Study Engineers | Coremakers |
| Clerks | Molders |
| Cost | Iron Pourers |
| Payroll | Cleaners |
| Bookkeepers | Annealers |
| Statistical | Grinders |
| Stenographers | Chippers |
| Salesmen | Straighteners |
| Pattern Makers | |
| Die Makers | |

These jobs are now and should be filled by Ashtabula people—the right kind of people—

(a) Returning veterans
(b) Home Owners
(c) Thoughtful and ingenious men
(d) Men and women who want jobs in and are willing to help build a prosperous industry for the next five to twenty-five years.

**THE LAKE CITY MALLEABLE COMPANY**

**Cleveland, Ohio** -:- -:- **Ashtabula, Ohio**

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**SAND REPRESENTATIVE**

Old established company has permanent position for Salesman for mid-west territory. Must know sand control, analysis, and possess general foundry experience. Excellent opportunity for man of ability. State qualifications, references and salary requirements desired. Address: **Box 449**, The FOUNDRY, Cleveland 13, Ohio.

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**FACTORY**
**PRODUCTION MANAGER**
**WANTED**

Must have thorough experience, preferably handling varied types of production. Age 35 to 45. Good personality, diplomatic but with plenty of PUSH. Plant located in small town near good central Ohio city. Company makes a number of well-known consumer and commercial products. Rated AAA-1. Good salary. Excellent future. Write, giving complete experience and education.

**BOX 447**
**THE FOUNDRY CLEVELAND 13, OHIO**

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**EXPERIENCED FOUNDRY SUPERINTENDENT**

Gray Iron Foundry in Midwest manufacturing light-medium-heavy castings on production and jobbing basis to take complete charge of foundry department. Wonderful opportunity for the right man. State age and qualifications. Address: L. F. McCarthy & Co., 411 Provident Bank Building, Cincinnati 2, Ohio.

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**ASSISTANT FOUNDRY FOREMAN**

Small electric steel foundry needs working foreman to take charge of second shift. Must understand molding, melting, coremaking, cleaning and rigging. Location in Western Missouri. State age, education, experience, marital status and salary requirements. Address: Box 452, The FOUNDRY, Cleveland 13, Ohio.

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**REPRESENTATIVE**

Well established firm handling a special foundry line needs aggressive young man as representative in Illinois, Michigan, Indiana and Ohio. Should preferably have had some experience in foundry. All correspondence strictly confidential.

**BOX 455**
**The FOUNDRY CLEVELAND 13, OHIO**

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**FOUNDRY SUPERINTENDENT**

Grey Iron Foundry producing Heavy Machinery and Diesel Engine Castings has exceptional opportunity for thoroughly experienced foundryman. Must be able to estimate heavy jobbing work accurately from blueprints. State age, qualifications, references and expected salary. Address: Box 410, The FOUNDRY, Cleveland 13, Ohio.

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**ALUMINUM OPEN HEARTH OPERATOR**

Secondary nonferrous refiners. Midwestern Region. State experience, qualifications, references and wages desired in first letter. Address: Box 307, The FOUNDRY, Cleveland 13, Ohio.

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**WANTED**

By open hearth steel foundry located in Chicago area Assistant to Plant Engineer or Maintenance Foreman. Permanent. Please state experience in detail, education and salary requirements. Address: Box 392, The FOUNDRY, Cleveland 13, Ohio.

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**PERMANENT MOLD MAN**

Man wanted who can develop and take complete charge of permanent mold division of large New York City foundry. Must be experienced in designing as well as the production of permanent mold. Attractive salary to right man. Write giving full details. Address: Box 430, The FOUNDRY, Cleveland 13, Ohio.

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**STEEL AND ALLOY SALESMAN**

To travel for modern Detroit foundry. Salary and expenses. Give full particulars in first writing. Address: SWEDISH CRUCIBLE STEEL CO., 8561 BUTLER, DETROIT 11, MICHIGAN.

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**WANTED—PATTERNMAKERS**

Ideal working conditions $1.85 per hour. Must clear Patternmakers League of North America requirements. Write or come to: SONITH PATTERN WORKS, ATTN: MR. P. R. SNELL, 941 FORT WAYNE AVENUE, INDIANAPOLIS 7, IND.

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**BRASS FOUNDRY FOREMAN**

A working foreman to assist Foundry Superintendent in a well equipped production brass foundry; good opportunity for a hustler. State age, experience and salary desired in first letter. Address: Box 192, The FOUNDRY, Cleveland 13, Ohio.

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**FOUNDRY METALLURGICAL ENGINEER**

Growing company needs man having sound knowledge of the foundry manufacturing process and capable of advising engineers on ferrous and bronze materials. Prefer college graduate under 35 years old. Location New England. Address: Box 423, The FOUNDRY, Cleveland 13, Ohio.

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**BRASS OPEN HEARTH OPERATOR**

**Secondary nonferrous refiners. Midwestern Region. State experience, qualifications, references and wages desired in first letter. Address: Box 306, The FOUNDRY, Cleveland 13, Ohio.**

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**WORKING FOUNDRY FOREMAN**

Experienced on Iron, Bronze and Aluminum, rigging of Patterns, and the handling of men to get production. This is a small jobbing shop with a certain amount of small production jobs in Southern Florida with pleasant surroundings. State age, experience, salary expected and when available. Address: Box 399, The FOUNDRY, Cleveland 13, Ohio.

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**SUPERINTENDENT WANTED**

Well established nonferrous foundry in Detroit area—50 employees—excellent opportunity for right man. Give full details in reply. Address: Box 413, The FOUNDRY, Cleveland 13, Ohio.

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**FOUNDRY FOREMAN**

For mechanized grey iron foundry in Middle West. Address: Box 404, The FOUNDRY, Cleveland 13, Ohio.

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Are **YOU** in need of foundry equipment?
Do **YOU** have equipment to sell?
Are **YOU** looking for experienced men?
Do **YOU** want to obtain a position?
If **"Yes"** is your answer to any of the above questions, may we offer the services of the Classified Advertising Department of The FOUNDRY?

**POSITION WANTED**

**Minimum advertisement set solid, 30 words $1.50. Additional words 5c each.**

**HELP WANTED**

**Minimum advertisement set solid, 30 words or less $3.00. Additional words 10c each.**

**FOR SALE**

**Minimum advertisement set solid, 30 words or less $3.00. Additional words 10c each.**

**WANTED**

**Minimum advertisement set solid, 30 words or less $3.00. Additional words 10c each.**

**Miscellaneous advertisements such as "Personals", "Services" etc., minimum 30 words set solid, $3.00. Additional words 10c each.**

*Forms close 13th of month preceding issue*

Note: If replies are to be sent to a box number in care of The FOUNDRY, add 6 words to your advertisement for box number and address.

Any advertisement set in all caps, add 50% to above rates.

# Classified Advertising

## Positions Wanted

**PATTERNMAKER**

Many years general pattern shop experience in both wood and metal. Can estimate costs and lay out work to produce accurate, sound castings from your printer. Capable of taking over shop, train apprentices and produce good day's work from patternmakers. Also first class mechanic and can qualify as working foreman in small shop. Age 51, American born, married, two children. State salary in reply. Will go anyplace. Address: Box 272, The FOUNDRY, Cleveland 13, Ohio.

**ASSISTANT SUPERINTENDENT**

Practical and technical trained iron and steel foundryman thoroughly familiar with cupola and converter steel, foundry sands and sand control, coremaking, molding, cleaning of castings, pattern making and time and motion analysis. General knowledge of all departments including costs, production and production control. Will go anywhere in United States, South America or other foreign countries. Am employed in assistant superintendent capacity at present. Age 31, married. Kindly state salary and promotion possibilities in first letter. Address: Box 416, The FOUNDRY, Cleveland 13, Ohio.

**PRACTICAL FOUNDRYMAN**

With 18 years assistant foundry superintendent on electrical steel, open hearth steel, gray iron and semi-steel. Knows floor, pit and machine molding for production. At present is assistant foundry superintendent. Would make a change if connections were right and can be available in two weeks. Can furnish the best of references. Address: Box 285, The FOUNDRY, Cleveland 13, Ohio.

**SUPERINTENDENT**

Gray iron foundry executive. Sound background and experience in all foundry procedure. Ability to achieve quality production. Practical and technical with all phases of foundry operations. Molding, coremaking, cupola operation, melting, metallurgy, costs, sales and contracts. Experienced trouble shooter between foundry laboratory, machine and pattern shop. Good rigger for production. In present connection years of experience as foundry superintendent with the responsibilities of a foundry manager. Address: Box 312, The FOUNDRY, Cleveland 13, Ohio.

**WORKS MANAGER—SUPERINTENDENT METALLURGIST**

Thirty years in iron and steel foundries. Have supervised the construction of one large steel foundry and the modernization of two others during the war. Unquestionably know melting, acid and basic electric and converter operation, production molding, sand control and general efficient supervision of all departments of the foundry. Can modernize your foundry and operate it efficiently. Age 49, college graduate. Address: Box 426, The FOUNDRY, Cleveland 13, Ohio

**HOW TO SELL THE CHICAGO AND MIDDLE WESTERN MARKET**

Live wire sales representative with 15 years' successful background, available to a manufacturer of Malleable and Cast Iron Pipe Fittings, Steel Pipe Nipples, Cast Iron Soil Pipe or Copper Tubing and Brass Pipe. I have orders on hand, also a very broad acquaintance with key buyers of, and major users of, these products in this territory, and by my sound sales plan will assure maximum results. If your company has these meritorious products and is deserving of optimum sales distribution, it will pay you to consider strongly my comprehensive sales-representation for your coverage of this territory. Can give you a minimum guarantee of set dollar volume or you need not pay me one penny commission if I fail to meet quota during 90 day trial period. Write or wire.

BOX 407
THE FOUNDRY CLEVELAND 13, OHIO

**SUPERINTENDENT**

Practical gray iron superintendent age 46, molder by trade, graduate chemist. Broad experience in modern foundry practice producing quality castings using continuous pouring, sand control, molding machines, core blowers, mechanical chargers, etc. Would like to contact reliable firm needing man with these qualifications. Address: Box 396, The FOUNDRY, Cleveland 13, Ohio.

## Positions Wanted

**SUPERINTENDENT OR GENERAL FOREMAN**

Steel or high alloy. Practical and technical experience in jobbing or machine production. Can handle men. Address: Box 427, The FOUNDRY, Cleveland 13, Ohio.

**GENERAL FOUNDRY FOREMAN**

With practical experience, thirty years in business. Will invest money in foundry when opportunity presents. Would like medium size foundry and medium class of work. Free to travel anywhere any time. References if requested. Address: Box 415, The FOUNDRY, Cleveland 13, Ohio.

**SUPERVISOR**

Eighteen years' foundry experience including Pattern Shop Foreman, Foundry Contact Man and Foundry Engineering desires position as Sales Representative in Northwestern Pennsylvania area. Age 40 years, married. Address: Box 377, The FOUNDRY, Cleveland 13, Ohio.

**FOUNDRY MANAGER OR SUPERINTENDENT**

Thoroughly experienced in all phases of foundry operation. Light, medium and heavy work. Green and dry sand. Jobbing and production. Practical molder and coremaker. A No. 1 cupola control. Well versed in grey iron metallurgy, foundry costs, production and executive capacities. Experienced in sales and contact. Good handler of men. Neat appearing and pleasing personality. Address: Box 968, The FOUNDRY, Cleveland 13, Ohio.

**SUPERINTENDENT ALUMINUM AND MAGNESIUM FOUNDRY**

Long experience in making automotive and aircraft castings by most up-to-date methods equips me to operate successfully any size shop. Best of references. Every phase of making castings from a practical way to supervising same are covered by this experience. Available on short notice. Address: Box 265, The FOUNDRY, Cleveland 13, Ohio.

**CHEMICAL METALLURGICAL ENGINEER**

Is looking for a connection with a manufacturer who is interested in organization of a Precision Casting Foundry. Diversified executive experience in all stages of ferrous and nonferrous castings of high quality; in charge of research and development department and has to his credit Patent pending for low alloy corrosion resisting steel. Address: Box 417, The FOUNDRY, Cleveland 13, Ohio.

**SYNTHETIC SAND**

Specialist in synthetic molding sand, green and dry, grey and malleable iron and nonferrous metals, seeks short-term or permanent connection. Age 37. Address: Box 414, The FOUNDRY, Cleveland 13, Ohio.

**FOUNDRY ACCOUNTANT OFFICE MANAGER AND SALES**

Would like to connect with grey iron or brass foundry, possibly with investment. Location Wisconsin or Iowa. Address: Box 422, The FOUNDRY, Cleveland 13, Ohio.

**PRACTICAL FOUNDRYMAN**

Desires position as Superintendent of grey iron foundry. Thirty-one years' foundry experience, twenty-five years of which was spent as foreman and superintendent. Successful background of proven ability. Capable of taking complete charge of either production or jobbing shop. Address: Box 408, The FOUNDRY, Cleveland 13, Ohio.

**SALES FIELD**

Young Canadian residing in Windsor, Canada, 34 years of age with 13 years' foundry experience, practical and technical and graduate in modern foundry technique (I.C.S.) and a member of the American Foundrymen's Association desires to enter sales field of foundry equipment and supplies. Have excellent references and good personality. Address: BOX 444, THE FOUNDRY, CLEVELAND 13, OHIO.

**BRASS FOUNDRY SUPERINTENDENT**

Practical man, well educated and fully experienced in nonferrous metals and all phases of the trade. Rigging, blue prints, cost and estimating experience. Address: Box 390, The FOUNDRY, Cleveland 13, Ohio.

**FOUNDRY PRODUCTION MANAGER**

Foundry production manager for 25 years. Special experience in planning and production control. Address: Box 863, The FOUNDRY, Cleveland 13, Ohio.

## Positions Wanted

**TIME STUDY SUPERVISOR**

Eleven years' experience in both job and production foundries, thoroughly capable of rate setting, work simplification and job evaluation. Available January 1, salary open. Address: Box 409, The FOUNDRY, Cleveland 13, Ohio.

**FOUNDRY MANAGER OR SUPERINTENDENT**

McLain Graduate of Milwaukee. Practical foundryman with many years' experience in Gray Iron Cupola or Electric Furnace and nonferrous metals—light, medium and heavy castings. Understand foundry from molding, core room, grinding room to shipping room. A-1 foundryman. Age 44 with best references. Employed as foundry superintendent. Address: Box 339, The FOUNDRY, Cleveland 13, Ohio.

**STEEL FOUNDRY SUPERVISION**

By man with 16 years' practical foundry experience; 8 years' supervisor in core making, molding, sand control, scrap and yield. Capable of rigging. Thorough knowledge of stoker screw manufacturing. Age 36; married. Address: Box 406, The FOUNDRY, Cleveland 13, Ohio.

**FOUNDRY EXECUTIVE**

Now employed wishes to make a change. Has had years of experience. Unusual background of experience both in the foundry and the completion of the product. Have excellent reputation for developing new methods. Forty-one years of age, married and family. Address: Box 330, The FOUNDRY, Cleveland 13, Ohio.

**PRESSURE CAST MAN**

Capable of organizing and running a shop to produce pressure cast matchplates. Cope and drag equipment and precision castings. Address: Box 418, The FOUNDRY, Cleveland 13, Ohio.

**GENERAL MANAGER**

Mature, profit-minded, dependable. Has successfully managed four companies—two taken out of the red. Available for service shortly with medium-size company requiring reliable directing ability in management, sales, finance and production. Excellent experience machinery, tool, foundry and related lines. Address: Box 445, The FOUNDRY, Cleveland 13, Ohio.

**METALLURGIST**

Fifteen years' experience as chemist, metallurgist and foundry superintendent, stainless steel and electric furnace gray iron, light and medium weight pressure castings. Know melting, sand control, molding, coremaking, gates, risers and heat treating. Available January 1, 1946. Address: Box 446, The FOUNDRY, Cleveland 13, Ohio.

**BRASS AND FOUNDRY FOREMAN**

Practical man, 26 years' experience in dry and green sand, including high pressure castings. French sand ornamental and tablets work. Address: Box 453, The FOUNDRY, 16 E. 43rd St., New York 17, N. Y.

**FOUNDRY EQUIPMENT ENGINEER**

Experienced in layout, procurement and installation of all types of foundry equipment. Most recent experience having been in connection with sand reclamation plant. Address: Box 454, The FOUNDRY, Cleveland 13, Ohio.

**STEEL FOUNDRY SUPERINTENDENT**

Have a broad knowledge of the steel foundry game accumulated through twenty-five years of service. A thorough understanding of the merits of progressive feeding and the importance of producing well appearing castings homogeneously and also cost minded. My understanding of Labor Relation has been gained through years of handling labor and know the problems of both labor and management. Age 45 years. Address: Box 448, The FOUNDRY, Cleveland 13, Ohio.

**CLEANING ROOM FOREMAN**

Fully experienced in cleaning room work on steel and nonferrous castings small and large. Age forty-nine, married and dependable. Can furnish the best of references. Available at once. Address: Box 425, The FOUNDRY, Cleveland 13, Ohio.

## Open Capacity

**OPEN CAPACITY**

Nonferrous Foundry has open capacity of 2 to 3 tons daily. Can handle permanent mold and sand castings in brass, bronze, copper, aluminum, etc. Close control to your specifications. Address: Box 451, The FOUNDRY, Cleveland 13, Ohio.

# Classified Advertising

## Open Capacity

We have open capacity for production work on gray iron and alloy castings from one to six thousand pounds per casting weight. Address: MID-WEST FOUNDRY, 3430 BRIGHTON BLVD., DENVER 5, COLO.

## Capacity Wanted

**FOUNDRY CAPACITY WANTED**

Small gray iron castings in large quantities. Steady requirements. Long runs. Address: Box 356, The FOUNDRY, Cleveland 13, Ohio.

**FOUNDRY CAPACITY WANTED**

ALUMINUM PERMANENT MOLD CASTINGS may help get your product to market earlier; may cut machining and finishing costs and increase tensile strength. If you require quantity production in a hurry, it will pay you to send us your prints or sample today for quotation.

**FLORIDA DIE CASTING FOUNDRY**
**131 W. KALEY AVE. ORLANDO, FLA.**
**PHONE 5215**

## Opportunities

**AVAILABLE GRAY IRON**
**FOUNDRY CAPACITY**

Snap Castings

Heavy Floor Work

Prefer Castings Requiring

Machining to Utilize

Machine Shop Facilities

Send Prints and Specifications

for Price Quotations

**BOX 421**

**THE FOUNDRY CLEVELAND 13, OHIO**

**CASTING WORK**

Machinery Manufacturer requires Grey Iron Foundry source for miscellaneous casting work.

**BOX 352**

**THE FOUNDRY CLEVELAND 13, OHIO**

**WANTED CASTINGS TO MAKE**

Jobbing foundry in North Alabama would like to take on additional work. Gray iron castings up to 300 lbs. in weight preferred. Address: ELKIN FOUNDRY, BLUE SPRING STREET, HUNTSVILLE, ALABAMA.

**OPPORTUNITY**

**We can furnish empty tight and slack wooden barrels also steel drums for your products ADDRESS: BUCKEYE COOPERAGE, STATION C.P.O. BOX 1501, CLEVELAND, OHIO.**

## Opportunities

**WANTED**

Foundry to make small gray iron castings. Can give contract for 350 to 500 tons first year. Aluminum match plates furnished. Address: P. O. BOX 31, OCONTO, WIS.

Large manufacturer will purchase up to 51% interest in grey iron foundry and will supply sufficient orders for continuous operation up to 20 tons a day.

**IRON FOREMAN MANUFACTURING CO.**
**PORTLAND, OREGON**

## Correspondence Course

**MIXTURES—MELTING—SEMI-STEEL**

Our system in plain foundry terms, 90% applicable to your practice will save you coke, reduce losses and build up human element. Get our report on your cupola, eliminate mysteries, use 10 to 50% steel scrap, depending on section, obtaining a metal more pure, homogeneous, with higher strength. Synopsis free.

**MCLAIN'S SYSTEM INC.**

**236 E. NORTH AVE. MILWAUKEE 12, WIS.**

## Wanted-To-Buy

**WANTED**

Portable drawer type Core Oven. Approximate size of drawer 60" wide by 49" long by 8" deep, 5 drawer height, oil fired. Address: Box 450, The FOUNDRY, Cleveland 13, Ohio.

**WANTED**

Used cupola, Whiting, Size 7, or other good cupola capable of melting 9 to 10 tons per hour; also blower for same. Call, write or wire: J. B. STUBBLEFIELD, P. O. BOX 1622, MEMPHIS 1, TENNESSEE.

**WANTED**

2—#332 or 333 Osborn jolt roll-over pattern draw molding machines. State age, service and price. Address: FRANK FOUNDRIES CORP. MOLINE, ILLINOIS.

**WANTED**

All types of foundry equipment for new nonferrous foundry including conveyor systems, furnaces, sand mixers, molding machines, etc. Immediate cash available. Address: Box 431, The FOUNDRY, Cleveland 13, Ohio.

**TO BUY OR LEASE**

Gray iron foundry in midwest. Must be reasonably equipped to handle 3-20 tons daily. Address: Box 420, The FOUNDRY, Cleveland 13, Ohio.

**WANTED**

Small Foundry, fully equipped. For small gray iron castings. Give full particulars. Address: Box 357, The FOUNDRY, Cleveland 13, Ohio.

**WANTED**

To buy small brass foundry with or without machine shop or will rent or lease building suitable for such purpose. Location in or within fifty miles of Cleveland, Ohio. Address: Box 424, The FOUNDRY, Cleveland 13, Ohio.

**MIXERS WANTED**

Used Simpson Intensive Sand Mixers. State size, condition and lowest cash price for immediate acceptance. Address Box 578, The FOUNDRY, Cleveland 13, Ohio.

## Wanted-To-Buy

**SIMPSON MIXER WANTED**

8' or 9' Diameter Simpson Intensive Mixer for grinding clay. State size, condition and lowest price.

**UNIVERSAL SEWER PIPE CORPORATION**
**1500 UNION COMMERCE BLDG.**
**CLEVELAND, OHIO**

**WANTED**

One used #3 U. S. Rotary Melting furnace. Address: BEEMAN FOUNDRY CO., 1739 N. W. 3rd St., OKLAHOMA CITY, OKLA.
AD 951

**WANTED**

Several 16" dia. cylinder Nicholls jolt squeeze or jolt strip squeeze molding machines. Address: Box 403, The FOUNDRY, Cleveland 13, Ohio.

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**REBUILT EQUIPMENT IN STOCK**
**IMMEDIATE SHIPMENT**

**ELECTRIC MONORAIL HOISTS**

(2)—1/2-ton Shepard, 220/3/60-cy.
(1)—1/2-ton LoHed, 220/3/60-cy.
(1)—1-ton Northern, 220/3/60-cy.
(1)—1-ton, 2-motor, cage or floor operated, 230-VDC. Cleveland Tramrail.
(1)—7½-ton, Shepard, 2-motor, cage operated, 230-VDC., 40' 0" lift, excellent for monorail yard service.

**AIR COMPRESSORS**

(1)—10 x 10 Chicago, 250 CFM. @ 125 lbs. with 220/440-VAC Motor.

**OVERHEAD ELECTRIC TRAVELING CRANES**

| | TONS | MAKE | SPAN | CURRENT |
|---|---|---|---|---|
| (1) | 3 | Shaw | 37' 4" | 220-VAC. |
| (1) | 8 | Toledo | 51' 6" | 230-VDC. |
| (1) | 15 | Alliance | 50' 0" | 230-VDC. |
| (1) | 20 | Cleveland | 50' 0" | 230-VDC. |
| (1) | 15 | Shaw | 106' 8" | 230-VDC. |

**SPECIAL**

(1)—1½-yd. cap. 2-line Lakeside Bucket Handling O.E.T. Crane, 59' 0" span, 220/3/60-cy., practically new, roller bearing throughout, with totally enclosed ball bearing motors. COMPLETELY REBUILT READY FOR IMMEDIATE SHIPMENT.

**SPECIAL**

(1)—3-ton Chesapeake 3-motor, CG. OP., 220/-440-VAC. Gantry Crane, 18' 11" bet. legs, 15' 6" overhang each end. REBUILT.

WE OWN AND HAVE ALL THIS EQUIPMENT IN STOCK. IT IS OFFERED REBUILT IN OUR LARGE MODERN PLANT AND FULLY GUARANTEED.

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**4304 CLARISSA ST.**
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**CENTRIFUGAL COMPRESSORS AND BLOWERS**

2100 CFM GE with 10 HP 3/60/3450 RPM motor.

1200 CFM Buffalo, 9½ x 7 x 7¼ with 7½ HP, 220/3/60 1750 motor.

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150 CFM @ 502, North American 19" dia. with ¾ HP 3/60/220/440 volt 3500 RPM.

**THE MOTOR REPAIR & MFG. CO.**

**1552 HAMILTON AVE. CLEVELAND, OHIO**

# Classified Advertising

## For Sale

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1½-Ton P&H 28′ & 34′ Span
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2-Ton Shephard Niles 18′ Span
3-Ton Euclid 38′8¾″ Span
5-Ton Shephard Niles 40′ Span
5-Ton Shaw 82′ Span
5-Ton "American" 70′ Span
5-Ton American 47′5″ Span
5-Ton Manning Maxwell Moore 31′ Span
5-Ton Case Gilbert 44′9¾″ Span
5-Ton P&H 44′9¾″ Span
5-Ton Champion 44′9¾″ Span
5-Ton Bedford 34′ Span
6-Ton P&H 78′ Span
6-7-Ton Milwaukee 70′ Span
6-Ton "American" 77′ Span
7½-Ton P&H 30′6″ Span
7½-Ton Lakeside 100′ Span
7½-Ton Bucyrus-Erie 70′ Span
10-Ton P&H 60′ Span
10-Ton Milwaukee 58′9″ Span
10-Ton Morgan 39′5″ Span
10-Ton Alliance 58′9″ Span
10-Ton Erie 80′ Span
10-Ton Emsco 80′ Span
10-Ton P&H 78′ Span
10-Ton Bedford 78′ Span
10-Ton "American" 27′ Span
15-Ton Whiting 57′3″ Span
15-Ton Leonard-Burke 74′9″ Span
15-Ton Shaw 77′ Span
15-Ton Shaw 82′ Span
15-Ton Whiting 74′8″ Span
15-Ton Niles 32′ Span
15-Ton Chesapeake 55′6″ Span
15-Ton Alliance 35′ Span
15-Ton Northern 53′ Span
20-Ton Alliance 77′ Span
20-Ton P&H 51′4″ Span
20-Ton Shephard Niles 44′9″ Span
20-Ton P&H 50′ Span
20-Ton Whiting 80′ Span
20-Ton P&H 51′4″ Span
25-Ton P&H 74′8″ Span
25-Ton Leonard Burke 74′8″ Span
25-Ton Whiting 82′ Span
25-Ton Niles 46′ Span
25-Ton Shaw 70′ Span
25-Ton Cleveland 106′ Span
30-Ton Morgan 30′ Span
30-Ton Niles 53′9″ Span
30-Ton Whiting 60′ Span
35-Ton Northern 22′ Span
35-Ton Alliance 90′ Span
75-Ton Alliance 37′ Span
80-Ton "American" 40′6″ Span
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200-Ton Alliance 100′ Span

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**CONSOLIDATED ELECTRIC & AIR PUMP CO.**
**141 MANGIN ST.**
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One Roots Rotary Blower 2465 CFM 14.3

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**HAYNES FOUNDRY EQUIPMENT COMPANY**
**1734 LAKE ST. KALAMAZOO 21, MICH.**

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1—International Jolt Rollover Moulding Machine 20 x 8 Type G, Heavy Duty.
Price $475.00

1—Lever Lift Hydraulic Lift Truck Made by Service Caster & Truck, Model X W, 11″ Lowered Height, 24 x 60 Cap. 2500 lbs.
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**E. L. LeBARON FOUNDRY COMPANY**

**COMMERCIAL YARD, BROCKTON, MASS.**

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1—Hausfeld Tilting Crucible, without refractory linings, suitable for up to No. 200 crucible 33″ dia. shell.
1—Hausfeld Same as above—lined. Oil or gas.
1—Schwartz, 42″—No. 1, oil fuel, 16″ hole.
1—Monarch, Tilting, for 100 lb. alum. iron pot.
**Molding Machines:**
1—International-Portable, jolt, rollover draw, 24″ x 33″ table foot draw 8″, vibrator & flask rest equalizers.
Tabor-portable, 6″ dia. cushioned jolt—with adjustable pin lift or for strip service. Table 30″ x 40″.
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2—Inter'l, type F—24″ x 10″ jolt, rollover draw.
2—Inter'l, type F—28″ x 12″ jolt, rollover, draw.
1—Inter'l, type M—18″ x 8″ jolt, hand rollover, draw.
3—Mumford Core jolt tables 20″ x 15″ on stands.
1—Osborn No. 450 Jolt-Stripper, stationary.
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All round steel mills with dust exhaust.
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**CLIFTON MACHINERY CO.**

**1023 W. 6TH, CINCINNATI 3, OHIO**

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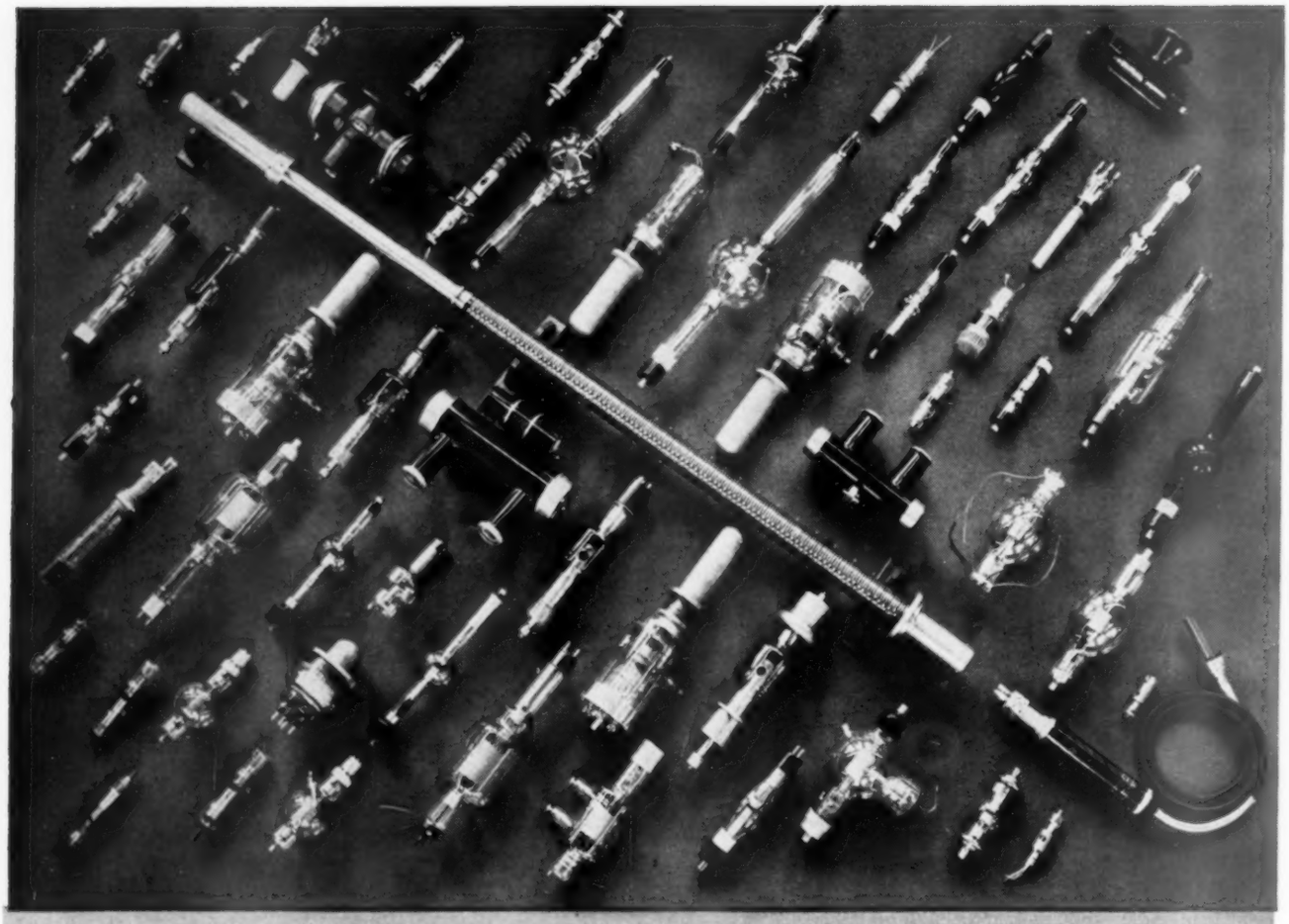

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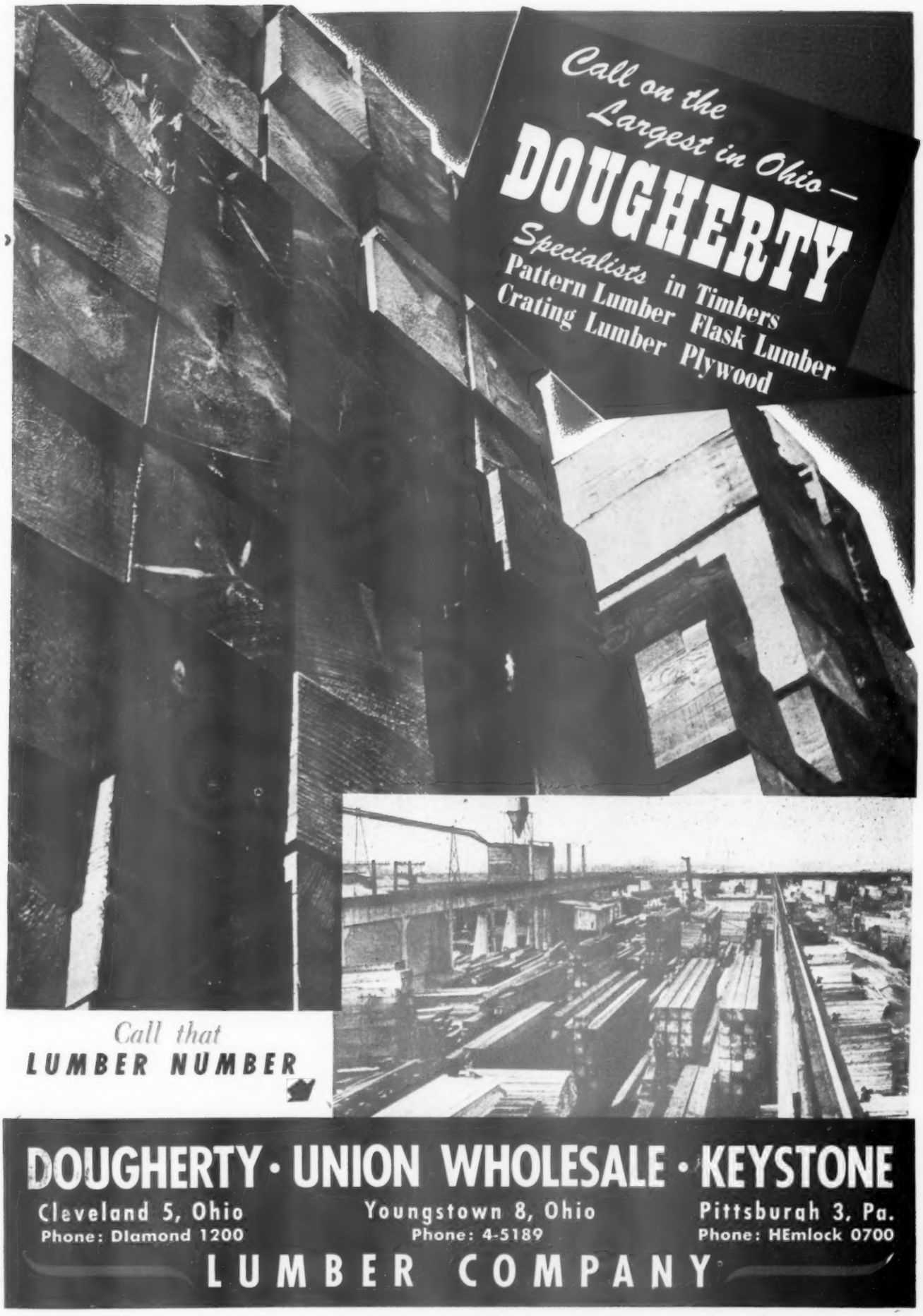
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STEVENS INCORPORATED
EVERYTHING FOR A FOUNDRY
DETROIT 26 MICHIGAN

# 6 Stevens Products for Quality Castings

The main objective of our business is to help foundrymen produce QUALITY CASTINGS. The six Stevens Products listed below were developed to do just that . . . at a minimum of labor and cost.

Stevens Core Coatings—tested under actual working conditions—give proper adherence, good suspension, correct penetration, uniform coverage and good heat resistance, characteristics which help materially in producing "QUALITY CASTINGS."

Write and tell us what metal you are pouring—type and size of castings being made, and whether green or dry sand is being used. We will gladly send our recommendations, together with working samples of the Coating best suited to that type of work.

This will in no way obligate you, but, chances are that after you have tried out the sample, you will order Stevens Core Coatings exclusively.

*This label on a barrel of Core Coating is a guarantee of Quality*

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INDIANA . Hoosier Supply Co., 36 Shelby St., Indianapolis, Ind.

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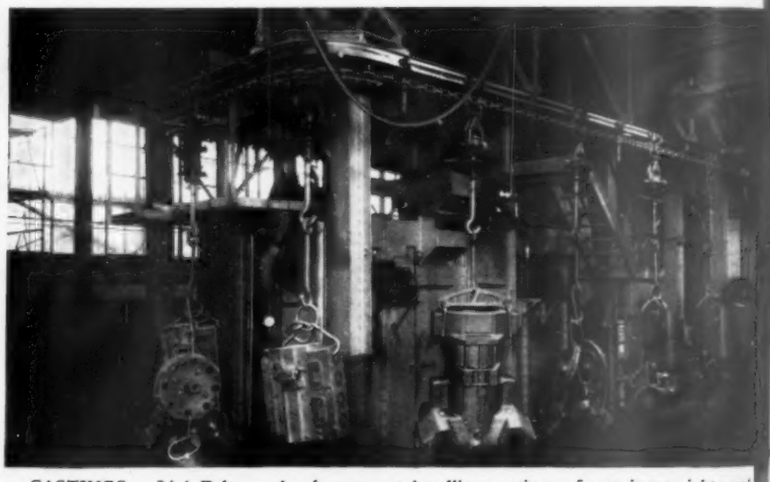
# LINK-BELT OVERHEAD TROLLEY CONVEYORS

## . . . Modernize Obsolete Foundry Layouts

## . . . Permit Straightline Production Without Costly Rebuilding

CORES — Up and down — around curves — with freedom from jerks and vibration, a Link-Belt overhead trolley conveyor safely transports sand cores.

● The Link-Belt trolley conveyor has unlimited possibilities in handling castings, cores, and in many cases, the mold. Supported from overhead, it saves floor space, is flexible in arrangement, efficient and smooth in operation. It travels irregular paths at predetermined speeds to meet production requirements. Simple, inexpensive and easily installed around existing equipment, readily altered, requires little power to operate and practically no maintenance. These photographs illustrate only a few of the many Link-Belt overhead trolley conveyor units in foundry service, operating in connection with Link-Belt continuous mold and sand handling and sand preparation systems.



CASTINGS — Link-Belt overhead conveyor handling castings of varying weights and shapes through a rotoblast intallation, quickly and economically. Castings as large as 6 ft. long and weighing a ton, are taken through the cleaning process as easily as such smaller units as motor blocks, wheel centers and gear housings.

MOLDS — Pouring on-the-run increases production—avoids congestion and improves working conditions. Especially suitable for long cooling runs around numerous turns.

CASTINGS from various shakeout stations are handled in perforated buckets or on special hooks suspended from this Link-Belt overhead trolley conveyor. They are cooled during travel on the conveyor and are discharged at a point adjacent to the cleaning and inspection department.

10105

**LINK-BELT COMPANY**

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AND PREPARATION MACHINERY

THE FOUNDRY

*wherever metals are cast...*

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## TIN TRUMPETS.

THERE is more life in a tin trumpet than there is in a grave yard, but it is the wrong kind of life—nobody likes it. It is too self-asserting—therefore we want to avoid tin trumpet advertising.

If you are building, starting, owning, renting, operating, running, or trying to run a foundry, we want you to know that we sell

**Foundry Supplies.**

THIS MEANS THE ENTIRE LINE, INCLUDING

**Molding Sand**

The various grades necessary for fine [illegible] including Stove Plate Sand. [illegible] best we have ever used. [illegible] the coarse grades for machinery and [illegible]

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STRAIGHT GOODS CAREFULLY SELECTED FOR FOUNDRY USE.

**Foundry Facings, Plumbago,**

And a complete line of Shovels, Riddles, Bellows, and the multitudinous other things required.

**CUPOLA BLOCKS**

OF ALL SIZES AND SHAPES.

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For Boiler Work and for Cupolas, Air Furnaces, etc.

THE RIGHT THING FOR THE RIGHT PLACE

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TELEPHONE 25.

Warehouse, 11 and 13 Atwater St. W.
TELEPHONE 2661.

THE FOUNDRY
SEPTEMBER 1892
Vol. 1. No. 1

# *In the Gay Nineties . . .*

Back in September 1892 . . . in the first issue of "The Foundry" the Stevens ad reproduced at the left, appeared on the inside back cover. Ever since that first issue, Stevens ads have appeared continuously on the same cover page . . . repeating the Stevens slogan

*"Everything for a Foundry"*

Times . . . yes, and methods have changed, but the QUALITY and DEPENDABILITY of Stevens Products have remained the same. If it comes from Stevens you can DEPEND on the QUALITY. It is the reason so many foundrymen make Stevens their headquarters for

FOUNDRY EQUIPMENT AND SUPPLIES

***See our ad on the inside back cover of this issue.***

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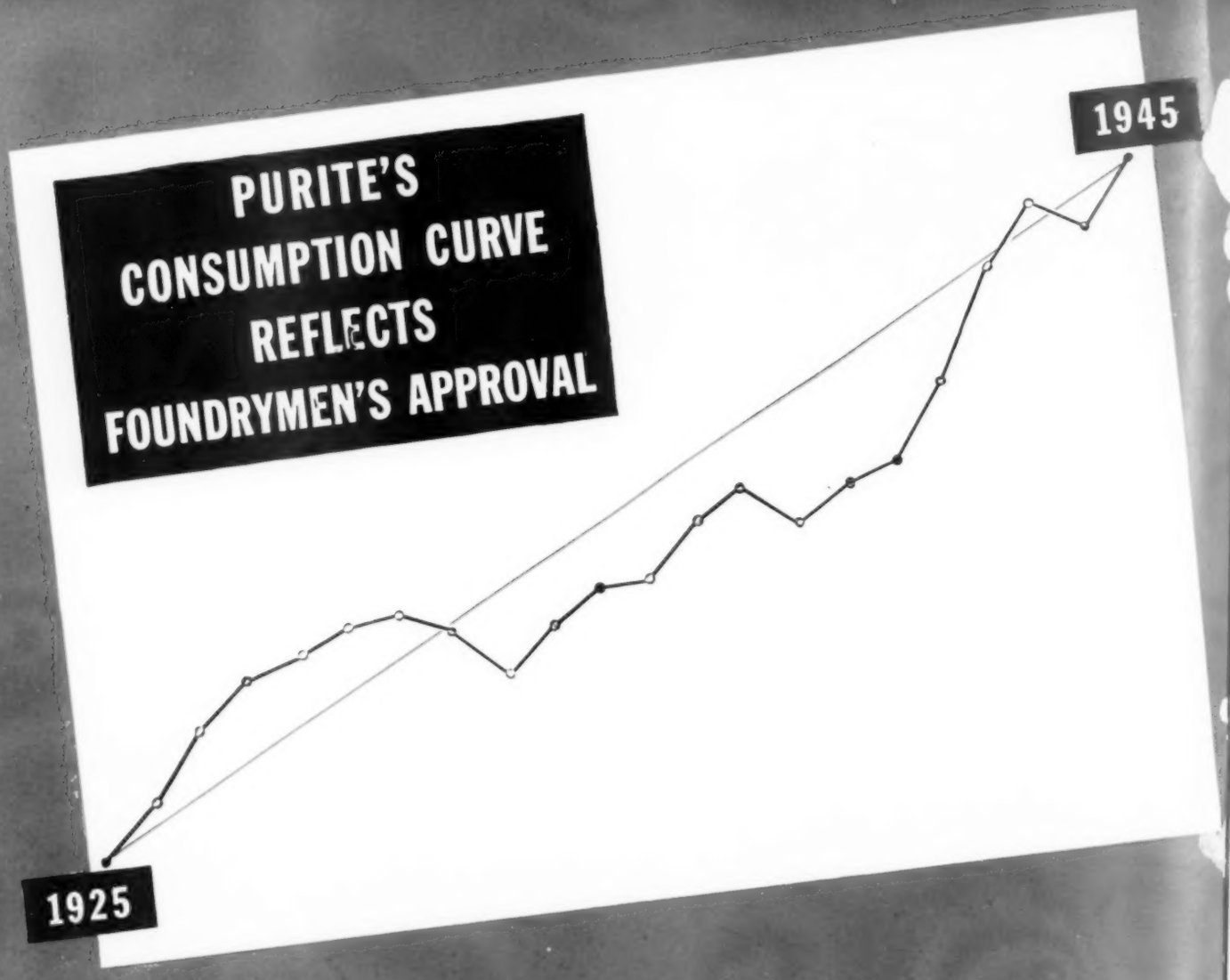
# PURITE'S CONSUMPTION CURVE REFLECTS FOUNDRYMEN'S APPROVAL




The steady climb of this consumption curve *proves* the value of Purite in refining cupola cast iron. The increasing demand for this scientific flux over a 20-year span is the best testimonial foundrymen can give to Purite.

Purite's remarkable action in desulphurizing and refining iron in the ladle or in the cupola hearth—its effect on combustion—and its action in smoothing out cupola melting operations are the reasons behind the ever-increasing use of Purite by progressive foundrymen everywhere.

Purite does *more* than remove sulphur; it purges molten metal of occluded gases, entrained oxide-silicates and other non-metallic impurities that may cause pinholes, gas pockets and segregated defects. Refining with Purite increases the strength . . . improves grain structure and machinability . . . speeds production of cleaner, sounder castings.

According to a recent survey, over 70% of the foundries in four principal casting centers in the North, South, East and Midwest are using Purite regularly. We feel you'll want to know why so many foundries consistently order Purite—so write for free factual information that tells how Purite helps them, and how it can help you in these competitive days.

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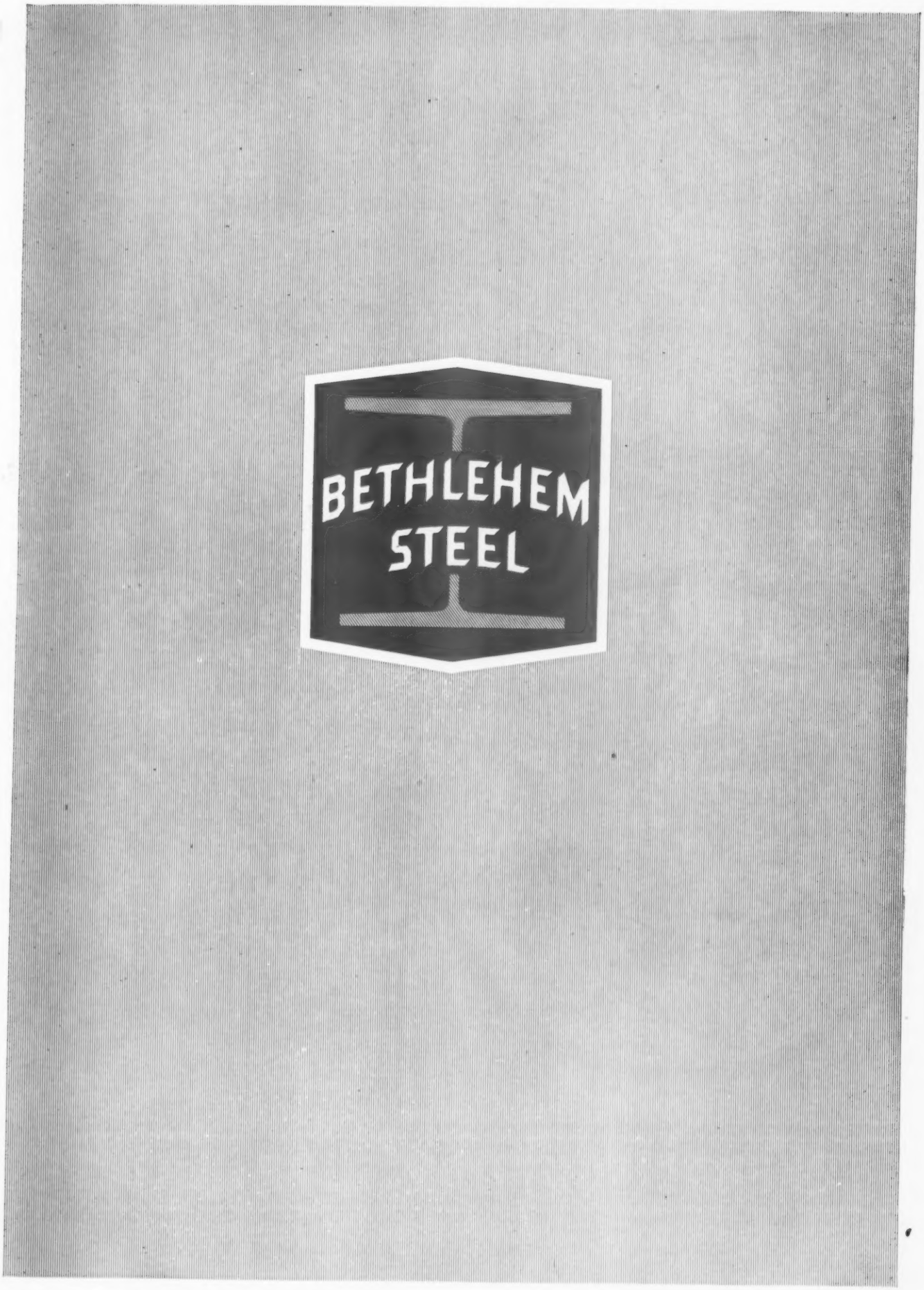
The Scientific Flux for Better Melting and Cleaner Iron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